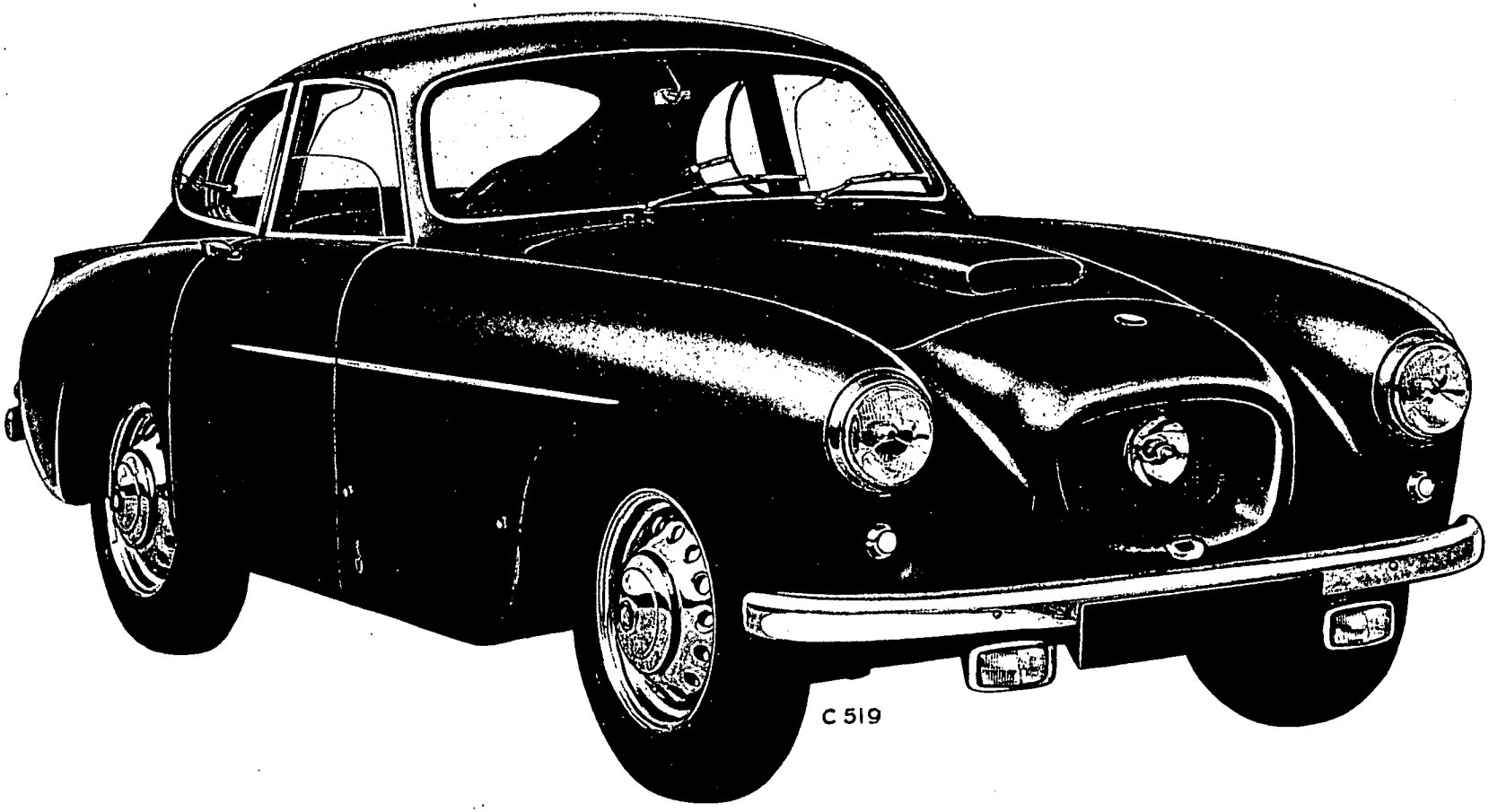
THE BRISTOL 2 LITRE CAR

TYPES 404 AND 405

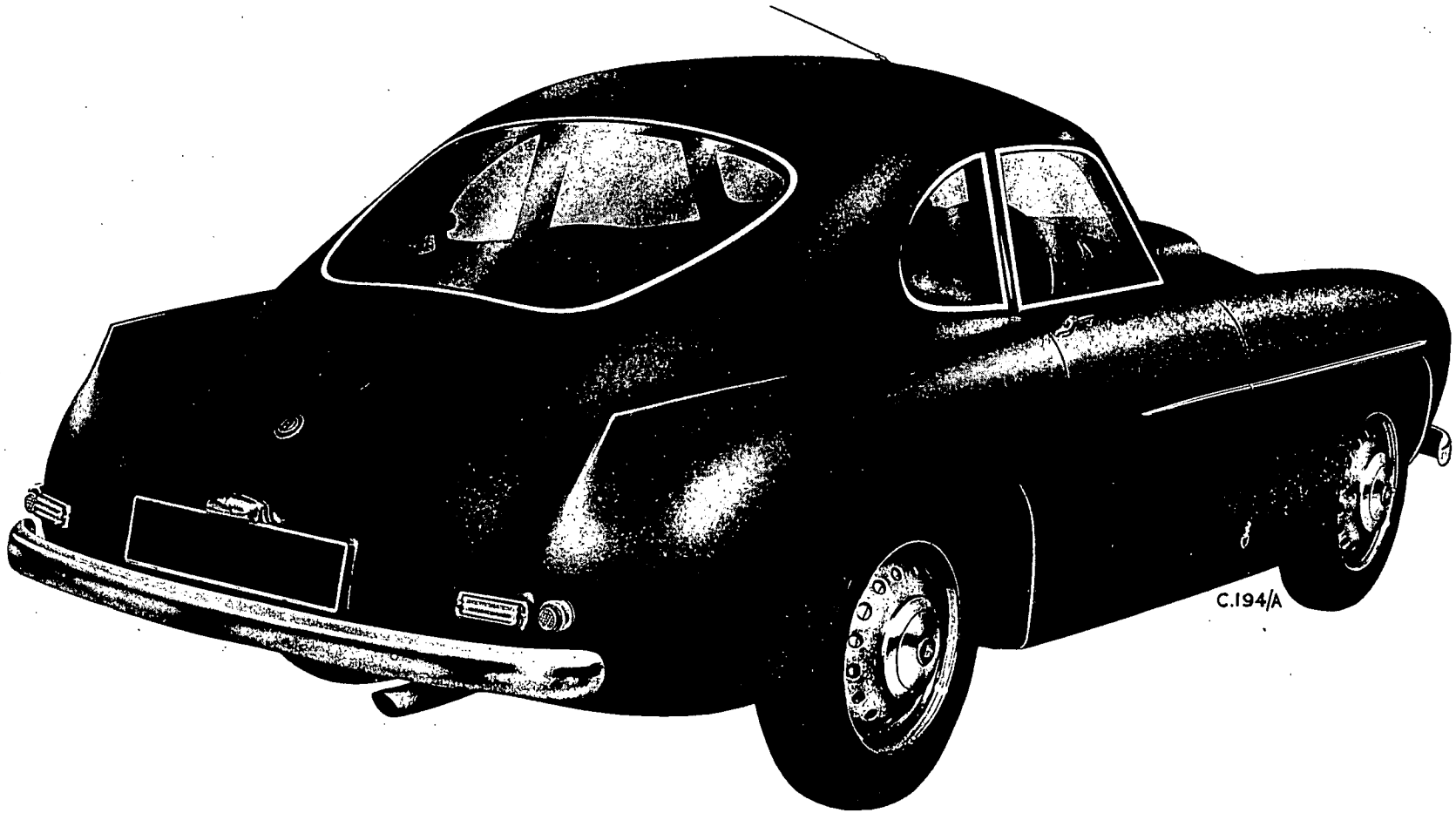
Workshop Manual

BRISTOL CARS LIMITED, FILTON HOUSE, BRISTOL, ENGLAND

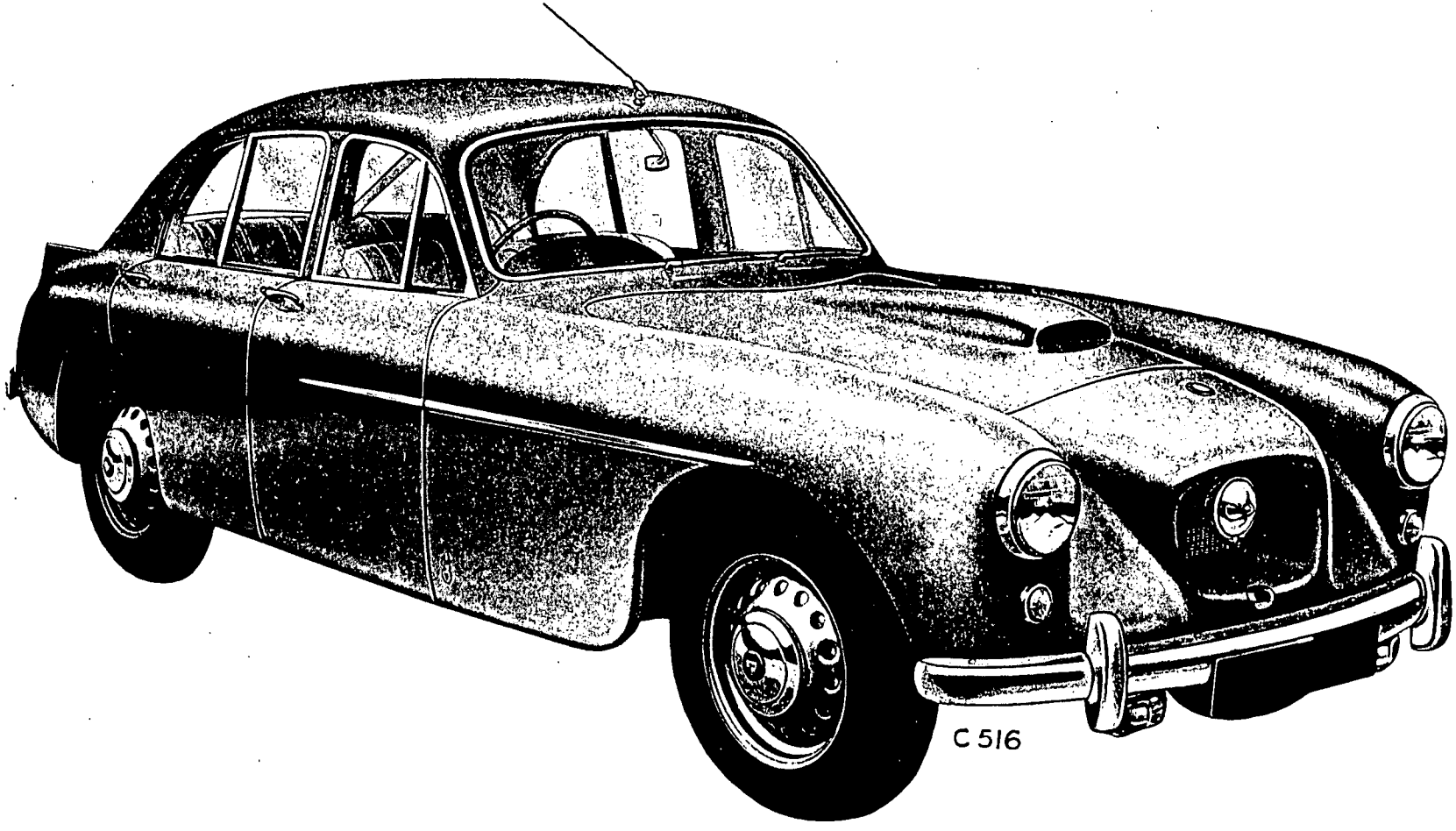
List of Sections



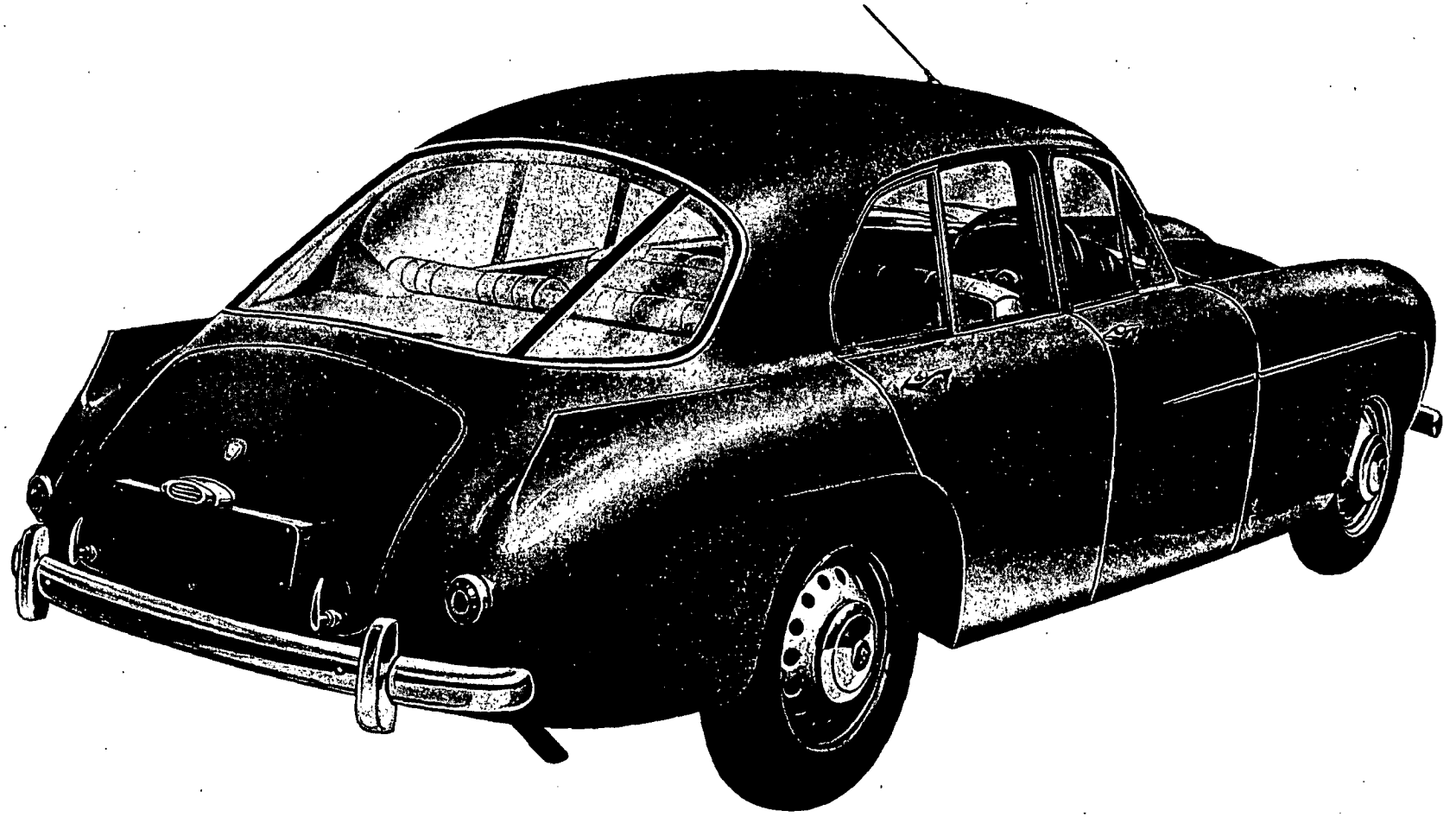
Type 404 Car Front View



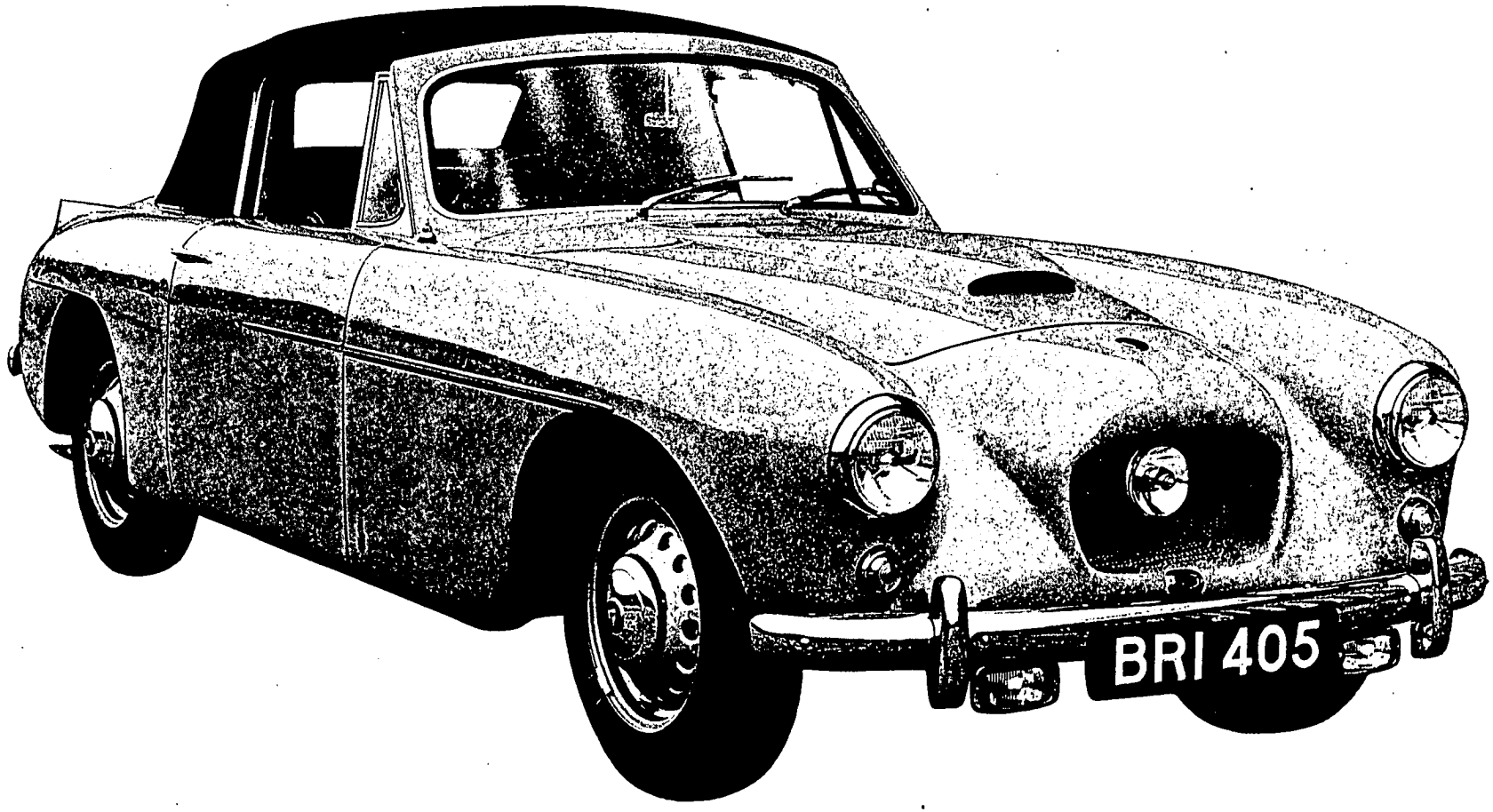
Type 404 Car Rear View



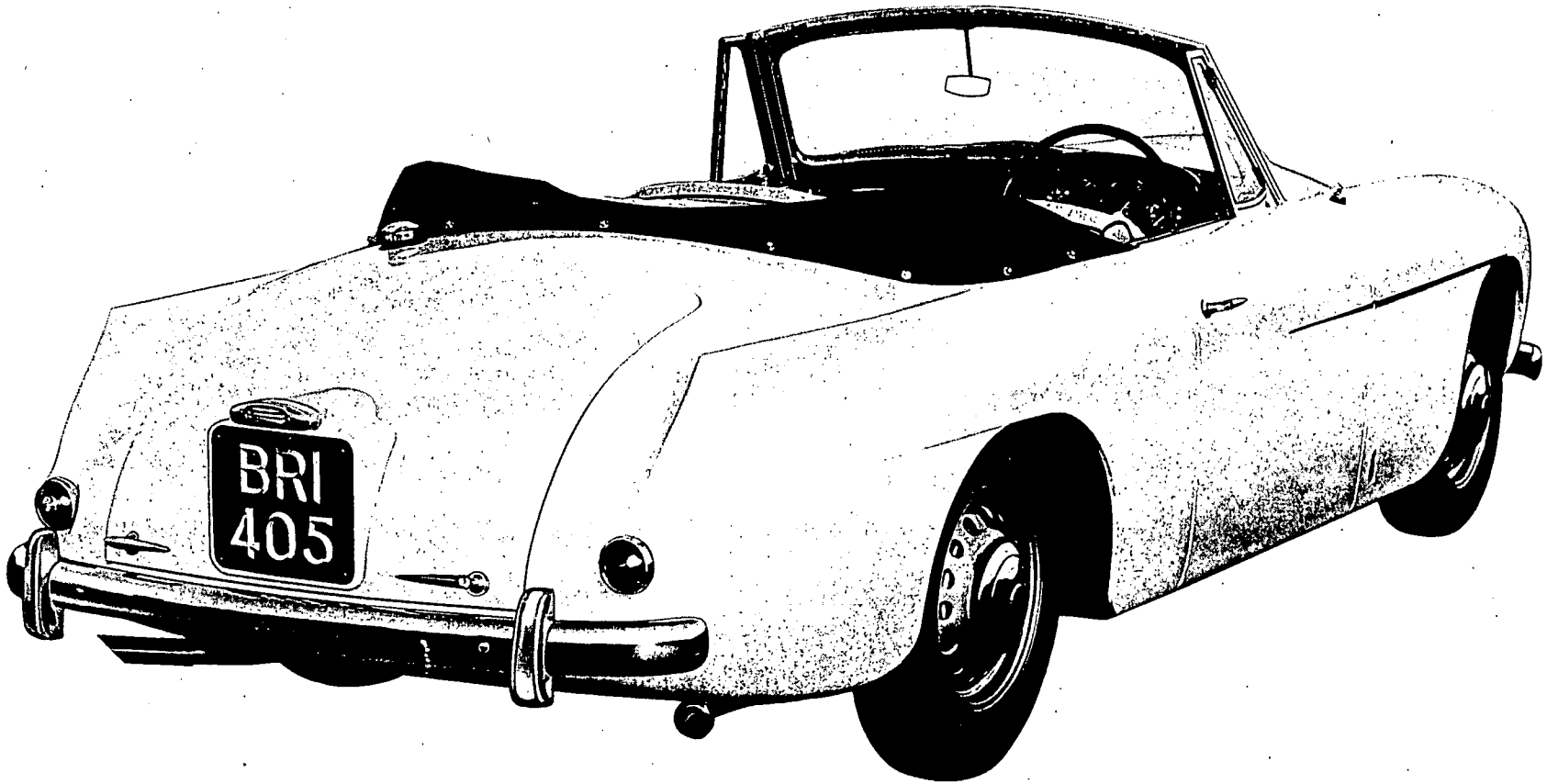
Type 405 Car Front View



Type 405 Car Rear View



Type 405 Drophead Front View



Type 405 Drophead Rear View

Introduction

This manual has been compiled to provide information on the maintenance and repair of the 'Bristol' Type 404 and Type 405 Cars.

For general day to day maintenance the owners Instruction Manual should be used as this may have information not dealt with in this workshop manual.

Each section describes practical dismantling repair or replacement and re-assembly of the various components and every effort should be made to conform to the standards and limits given.

From time to time amendments will be issued in order to keep the book up-to-date and these should be inserted into the appropriate section.

At the back of the book are the fully dimensioned drawings of the special tools which are mentioned in the descriptive matter. These tools are not available for purchase and the object of providing drawings is to (a) enable them to be made (b) to adapt similar mass-produced tools to do the work.

SERIAL NUMBERS.

When ordering replacement parts, always:

(a) Quote the Engine Number in full i.e. 100B2/4000.

(b) Quote the Chassis Number in full i.e. 405/4000.

(c) Where possible give the Part Number, the number of parts required and the full description of the parts.

(d) If in any doubt, send the old part with the request for the spare.

(e) Order from the nearest authorised 'Bristol' Distributor or Agent. Where this is impracticable, order direct from the Company.

Note. Left and right-hand side of the car is always understood as from the driving position. This should be carefully noted when ordering left or right-hand parts.

Orders given by telephone or telegraph should be confirmed immediately, in writing.

The Car Number Plate is attached to the bulkhead under the bonnet.

The Engine Number Plate is attached to the rocker box cover on the right-hand side.

The Chassis Number Plate is attached to the chassis frame on the left-hand side under the bonnet in the vicinity of the petrol pump.

Specifications

Dimensions

Type 404

Wheel Base.	8ft.0.25 ins. (244.5 CM).
Front Track.	4ft.4.36 ins. (133 CM).
Rear Track.	4ft. 6 ins. (137.16)
Turning Circle	32ft. 10 ins. (10M).
Ground Clearance	6.1/2 ins. (16.5 CM).
Overall Height	4ft. 7.3/4 ins. (142 CM).
Overall Width	5ft. 8.3/4 ins. (174 CM).
Overall Length	14ft. 3.1/4 ins. (435 CM).
Weight (approx.)	20 cwt. 50 lb. (1038 KG) (2290 lb.)

Type 405

Wheel Base.	9ft. 6 ins. (289.56 CM).
Front Track.	4ft. 4.36 ins. (133CM).
Rear Track.	4ft. 6 ins. (137.16 CM).
Turning Circle	37ft. 6 ins. (11.43 M).
Ground Clearance	6.1/4 ins. (15.9 CM).
Overall Height	4ft. 9.1/2 ins. (146.05 CM).
Overall Width	5ft. 8.3/4 ins. (174.6 CM).
Overall Length	15ft. 11.1/2 ins. (486.4 CM).
Weight (approx.)	24 cwt. 24 lb. (1233 KG). (2712 lb.)

Chassis Frame

Sheet steel construction. Rigid box section side members of 6.1/2 inch depth with three cross members.

Integral rear floor construction. Chassis frame internally soundproofed and finished with anti-rust paint.

Front Suspension

Independent. Transverse leaf spring with hydraulic telescopic shock absorbers. Anti-Roll Bar.

All joints lubricated by one-shot chassis lubricating system, spring and joints shrouded by gaiters.

Rear Suspension

Longitudinal torsion bars with hydraulic telescopic shock absorbers. Rear Axle located by suspension arms and triangulated stabilizing bracket. All friction surfaces lubricated direct from rear axle.

Steering

Rack and Pinion. Steering box lubricated from one-shot system.

Special two-spoke steering wheel with provision for three different positions on the steering column.

Brakes

Lockheed hydraulic brakes on all four wheels operated by master cylinder.

FRONT.
12 inch x 2.1/4 inch two leading shoe fitted with automatic adjusters. 'Alfin' type aluminium alloy brake drums with bonded cast iron liners.

REAR.
11inch x 1.3/4 inch single leading shoe brakes operating in chromidium brake drums.

Handbrake

Cable and rod operating to each rear wheel. Handbrake lever situated centrally between front seals.

Wheels and Tyres

Easy clean type road wheels pierced to permit ventilation of the brake drums.

For Tyres and pressures see Section 10.

Clutch

8" Borg & Beck. Single Dry Plate. Carbon Release Bearing.

Engine

Type 404.
Type 405 Drophead. 100B. (Single six branch Exhaust Manifold.)

Type 405. 100B2. (Two three branch Exhaust Manifolds).

Gearbox

Type 404 Car

BWCR/7 Gearbox without overdrive.

Gear Ratios (overall).

1st	14.08 to 1.
2nd	7.12 to 1.
3rd	5.04 to 1.
Top	3.9 to 1 (Direct).
Reverse	11.27 to 1.

Type 405 Car

BWCR/11 Gearbox with Laycock de Normanville Overdrive operating in Top Gear only

Gear Ratios (overall).

1st .....15.24 to 1.
2nd..... 7.71 to 1.
3rd..... 5.46 to 1.
4th ..... 4.22 to 1 (Direct).
Reverse .....12.20 to 1.
Overdrive..... 3.28 to 1.

Both gearboxes are of 'Bristol' manufacture with four forward speeds and reverse, Synchromesh on Top, third and second speeds and freewheel first gear.

Transmission

Fully balanced Propellor Shaft. Differential Gearbox with spiral bevel crown wheel and pinion. Banjo type rear axle casing with semi-floating half shafts.

Differential Gearbox Ratio.

Type 404.....3.9 to 1.
Type 405.....4.22 to 1.

Petrol Supply

Aluminium alloy petrol tank including inbuilt electrically operated reserve, the reserve warning light being mounted on the instrument panel. Supply transferred to Carburettors by engine driven mechanical petrol pump.

Capacities.

Type 404

16 galls. with 2.1/2 galls. reserve.
(72.7 litres.) (10.2 litres).

Type 405

16 galls. with 2 galls. reserve.
(72.7 litres) (9.09 litres).

Radiator

System.	Sealed with steam pressure relief valve.
Capacity of Cooling.	16 pints (9.09 Litres).
Radiator.	9.1/2 pints (5.4 Litres).
Engine.	4 pints (2.27 Litres).
Heater.	1 pint (.568 Litres).

Electrical Equipment

Lucas 12 volt system is a single wire type circuit having the positive (+) pole of the battery earthed to the engine and body. Current is supplied by a ventilated two brush dynamo in conjunction with a compensated voltage regulator on automatic cut-out and a 12 volt 51 ampere hour battery.

Heating and Demister Unit

Built into each car and not an extra. Supplies heated fresh air to car interior and into dashboard peak for demisting and defrosting. Air distribution regulated by controls on dashboard which enable heating and screen demisting to be used together or independently. In warm weather the system may be used as a fresh air ventilator.

Jacking System

Smiths Bevelift Jack stowed in the engine bay. Jacking point in the centre of each side of the car.

Tools

See tool kit.

Recommended Lubricants

Engine	Summer.	Mobiloil A. Essolube 30 Energol SAE 30 Shell X-100 30 Castrol XL.
	Winter.	Mobiloil Artic. Essolube 20 Energol SAE 20W Shell X-100 20/20W Castrolite.
Gearbox & Overdrive		Mobiloil A Essolube 30 Energol SAE 30 Shell X-100 30 Castrol XL.
Rear Axle & Propellor Shaft		Mobilube GX 140 Esso Expee Compound 140 Energol E.P. SAE 140 Shell Spirax 140 EP. Castrol Hipress.
'One Shot' Lubrication		Mobilube C.90 Esso Gear Oil 90 Energol SAE 90 Shell Dentex 90 Castrol ST.
Front Hubs and Rear Suspension Units		Mobilgrease MP. Esso Grease. Energrease C.3. Shell Retinax A Castrolease Heavy.
Water Pump		Pre-packed.
Distributor		Mobiloil Artic. Essolube 20 Energol SAE 20W Shell X-100 20/20W Castrolite.

Tools

At Chassis 4152 a plastic tool roll was introduced together with chrome plated Adjustable spanner and Pliers and a new screwdriver. Apart from this change all cars are supplied with the following tools.

All Type 404 Cars and Type 405 (to Chassis 4151).

N.705671 Tool Roll complete with tools comprising:

N.705458 Tool Roll.
N.600241 Spanner 3/16" x 1/4"
N.600251 Spanner 5/16" x 3/8"
N.600261 Spanner 3/8" x 1/2"
N.600211 Adjustable Spanner.
N.600221 Screwdriver.
N.600231 Pliers.
N.600121 Box Spanner-Cylinder Head.
N.600161 Ring Spanner-Cylinder Head.
N.600130 Tommy Bar-Box & Plug Spanner.
N.600321 Bleeder Wrench.
N.705749 Feelers.

Type 405 (Chassis 4152 on).

405-1-6009 Tool Roll complete comprising:

405-1-60011 Tool Wrap.
405-1-60010 Screwdriver.
405-1-60014 Adjustable Spanner.
405-1-60015 Pliers.
N.600161 Ring Spanner-Cylinder Head.
N.600241 Spanner 3/16" x 1/4"
N.600251 Spanner 5/16" x 3/8"
N.600261 Spanner 7/16" x 1/2"
N.600130 Tommy Bar-Plug & Box Spanner.
N.600121 Box Spanner-Cylinder Head.
N.705749 Feelers.
N.600321 Bleeder Wrench.

N.600311 Bleeder Tube-in tin.
N.600011 Plug Spanner.
N.705674 Bevelift Jack.
N.707126 Minalite Inspection Lamp.
405-1-66017 Wheel Brace.
404-1-60007 Starting Handle (Type 404 to Chassis 2051).
404-II-60006 Starting Handle (Type 404 Chassis 2052 on and Type 405)

Chassis No 4179.

Modifications

Type 404

On Cars up to Chassis 2028 the brakes were operated by a tandem master cylinder, the front cylinder operating the rear wheel brakes and the rear cylinder operating the front wheel brakes. At Chassis 2029 and onwards a single master cylinder is used which operates all four wheel brakes.

Instruments and instrument layout was changed at Chassis 2029 and the Heating and Ventilating System was re-designed at Chassis 2020.

Hinged Side Valances were of three types, Cable Release from a Button on the door pillars, Locking by means of a square key and finally toggle fastening on the underside ledge.

Type 405

Engine

At Chassis 4052 a Viscous Damper was fitted to the front of the Crankshaft. This necessitated a new Front Cross Member with revised front transverse spring clamping. It is important to note from this that replacement engines with Viscous Dampers fitted may not be fitted to any Type 404 Cars or to Type 405 Cars up to Chassis 4051.

At Chassis 4037 a cylindrical Air Filter/Silencer was fitted.

At Chassis 4137 a large nose type crankshaft was fitted together with new type connecting rods and big end bearings. The drive sprocket, crankshaft thrust plate, crankshaft oil baffle, Damper carrier, Camshaft Drive cover and its felt washer and the starter dog are changed to suit the new crankshaft.

At Chassis 4059 revised carburettor settings were introduced making the 3 Solex Carburettors similar as against the previous two outer carburettors and a different centre carburettor.

At Chassis 4137 the Carburettor controls were revised. The aluminium fulcrum brackets and the control shaft unit are altered and are not interchangeable with previous similar parts.

At Chassis 4067 an aperture covered by a swing cover was introduced into the top left hand side of the Clutch Casing. At the same time the Flywheel was clearly marked at Top Dead Centre and at 10° before Top Dead Centre. A central marking on the clutch casing aperture enables accurate sighting for engine and ignition timing.

Gearbox

At Chassis 4137 revised selector mechanism was introduced. Redesigned parts were the Gearbox Cover, 1st and 2nd. Selector Shaft, 3rd and 4th Selector Shaft. Selector Plate and Selector Ball Units. These parts are not interchangeable with previous gearboxes.

At Chassis 4185 redesigned Metalastik Mountings were introduced at the Overdrive to Chassis Frame attachment points.

Chassis

Rear Half Shafts up to Chassis 4171 have a single row (Brass Cage) ball bearing.

At Chassis 4172 a double row ball bearing is fitted with corresponding redesigned Half Shafts, Bearing Housings and Retaining nuts.

Body

At Chassis 4137 the Boot Door Spring Unit attachment brackets were repositioned to give the correct balancing.

Previous cars can be corrected by the introduction of an additional spring which fits inside the existing spring.

Overriders were fitted to later Type 405 Cars and they can be fitted readily to the earlier cars if required.

Engine

List of Contents

List of Contents

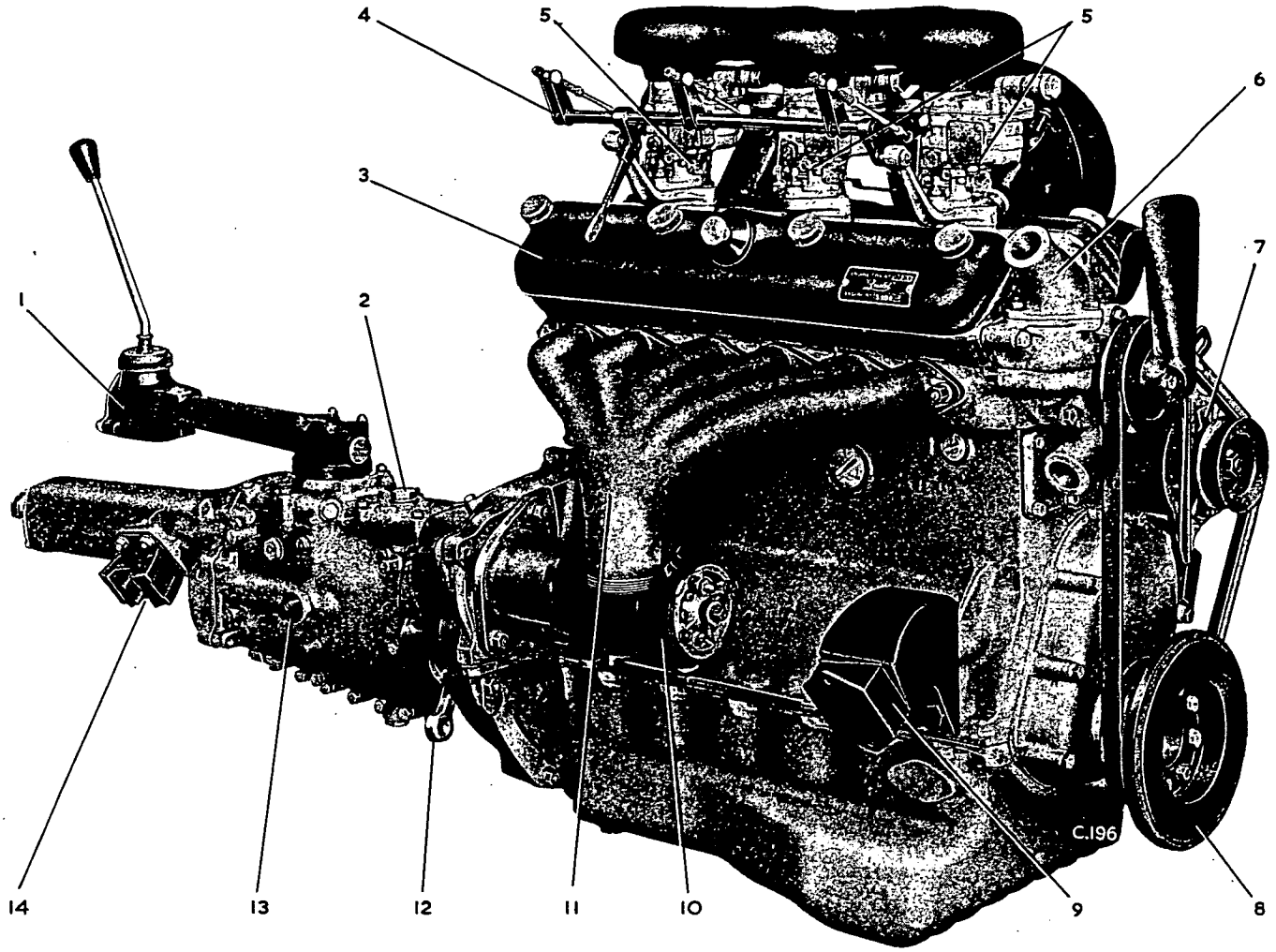
List of Contents

Engine Specifications

Decarbonizing

Removing the Engine

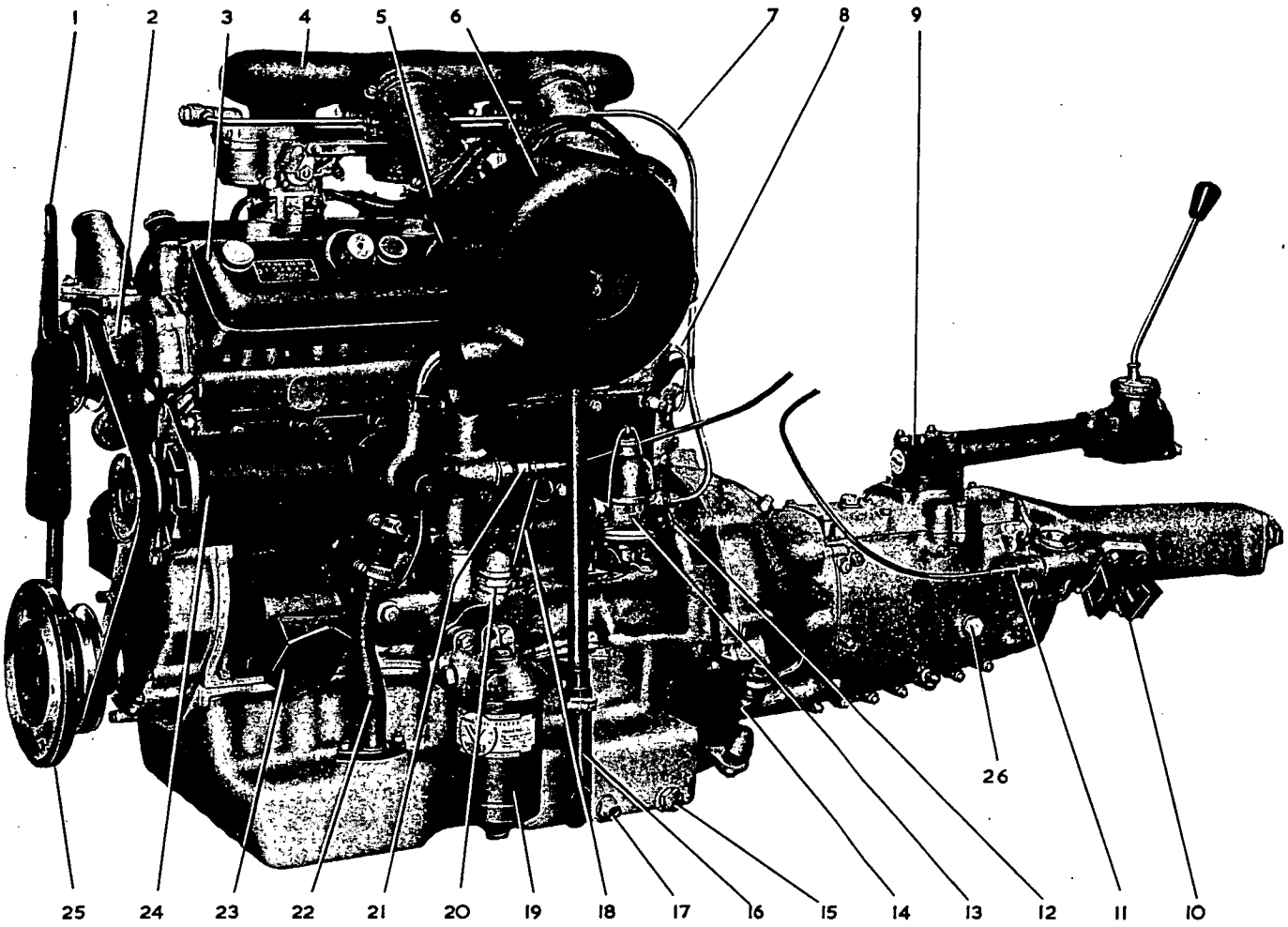
Engine Assembly Procedure



Key

1. Gearbox remote control.
2. Gearbox filler plug.
3. Exhaust rocker cover.
4. Throttle control layshaft.
5. Carburettors.
6. Water pump thermostat.
7. Dynamo cooling fan.
8. Vibration damper.
9. Engine front mounting.
10. Starter.
11. Exhaust manifold.
12. Clutch operating lever.
13. Reversing light switch.
14. Rear mounting.

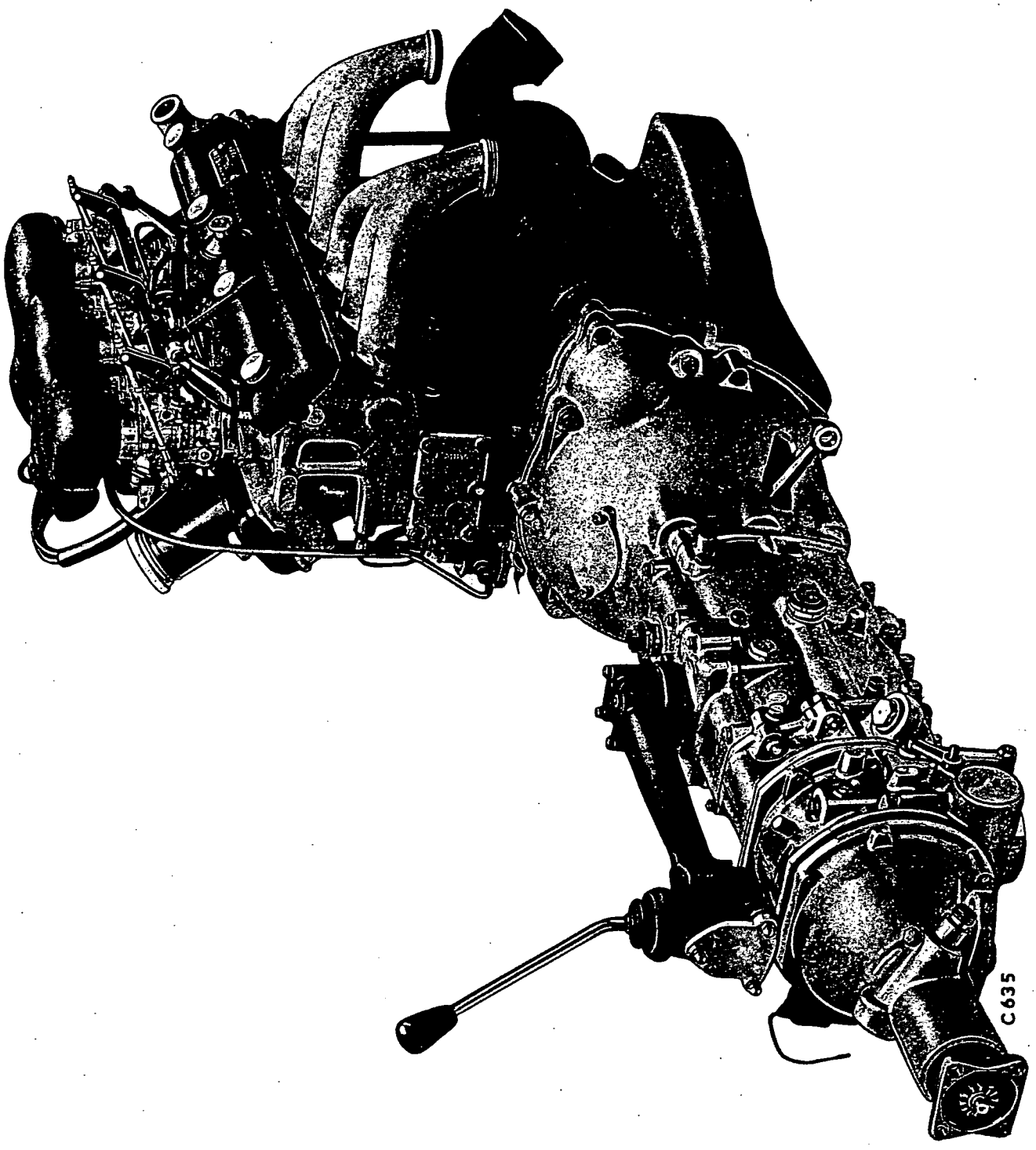
Type 100B Engine with BWCR7 Gearbox. R.H. Side



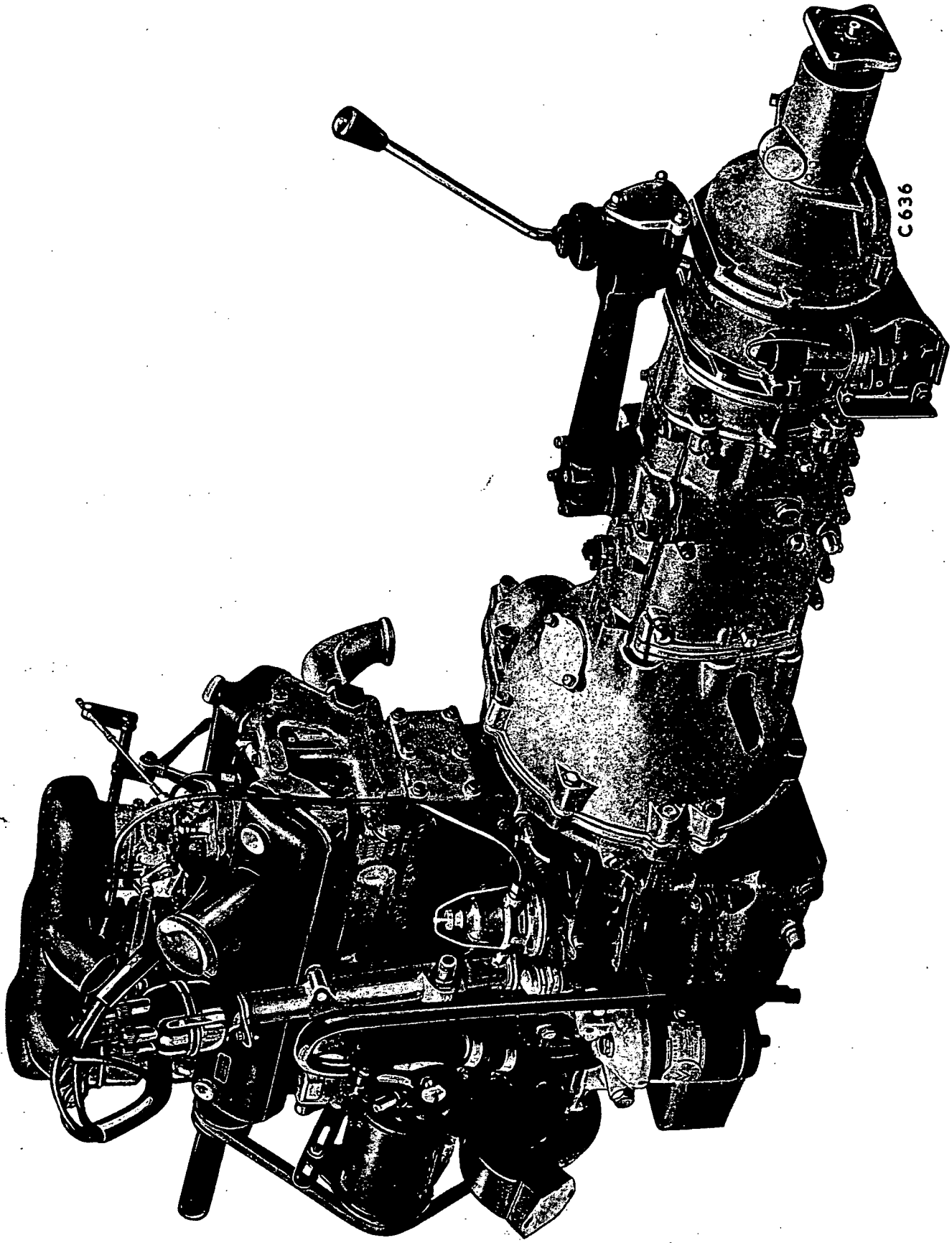
Key

1. Fan.
2. Water pump.
3. Inlet rocker cover.
4. Air intake manifold.
5. H.T. leads.
6. Air cleaner.
7. Petrol feed pipe (pump to carbs).
8. Oil feed pipe to rockers.
9. Gearbox remote control.
10. Rear mounting.
11. Speedometer drive.
12. Cylinder drain cock.
13. Petrol pump.
14. Torque buffers.
15. Sump drain plug.
16. Engine breather pipe.
17. Oil thermometer connection.
18. Dipstick.
19. Oil filter.
20. Oil pressure relief valve.
21. Engine speed indicator drive.
22. Oil return pipe separator.
23. Engine front mounting.
24. Dynamo.
25. Vibration damper.
26. Gearbox level plug.

Type 100B Engine with BWCR7 Gearbox. L.H. Side



Type 100/B2 Engine and BWCR11 Gearbox. R.H. Side



Type 100/B2 Engine and BWCR11 Gearbox. L.H. Side

Engine Specifications Decarbonizing Removing the Engine Engine Assembly Procedure

The Type 100B and B2 engine of 'Bristol' manufacture is an overhead valve six cylinder unit of 2 litres capacity. Bore 66 m/m (2.598 inch). Stroke 96 m/m (3.779 inch). Capacity 1971 c.c. Compression Ratio 8.5 to 1. RAC rating 16.2 H.P. Maximum power 105 bhp. at 5.000 rpm. Cylinder Block fitted with 'Brivadium' dry liners. Aluminium alloy cylinder head with steel 'shrunk-in' inserts for valves and bronze inserts for sparking plugs. Polished hemispherical combustion chambers. Overhead valve inclined at 80° operated by vertical and cross-head rods. K.L.G. P. TEN. L.70 Sparking Plugs.

Camshaft mounted in four pressure lubricated bearings and driven by a duplex chain.

Three multiple jet down draught carburettors fitted with air cleaner.

Aluminium alloy pistons and forged steel connecting rods. Forged steel crankshaft, nitride hardened and statically and dynamically balanced. Fitted with lead indium shell type steel backed bearings. Torsional vibration damper incorporating fan drive fitted to front end of crankshaft.

Fan and positive pump water circulation cooling system with thermostatic control. Thermo syphon circulation from head to block.

High pressure lubrication by Hobourn Eaton type oil pump to all engine bearings via full flow oil filter with provision for external oil cooler.

Maintenance of the engine is dealt with in two categories.

Decarbonizing.

Each component or section of the engine in its detailed form.

Decarbonizing

It is recommended that the following joints and gaskets should be obtained before starting this work.

N.310200	Joint Push Rod Cover.
N.321310	Joint - Rocker Box Section.
N.321330	Joint - Rocker Box - Exhaust.
N.321970	Joint - Rocker Box - Inlet.
N.322880	Gasket - Cylinder Head.
N.350240	Joint - Water Pump-Head.
N.350250	Joint - Water Pump - Pump.
N.360740	Joint - Oil Filter.
N.370030	Gasket - Exhaust Manifold (2)
N.370170	Joint - Carburettor Adaptor (3)
N.373320	Joint - Carburettor (3)
N.380110	Joint - Distributor Drive Casing.

This set of Gaskets is known as DEC.3. and can be ordered as such from a 'Bristol' Distributor or agent or direct from the works.

Dismantling, Decarbonizing and Reassembly

Disconnect the negative terminal from the battery.

Drain the water from the engine by opening the drain tap on the radiator and the drain tap on the left hand side at the rear of the cylinder block.

Remove the Hose connections between the radiator and the water pump.

Withdraw the sparking plug leads.

Detach the oil feed pipe and the revolution drive cable from the distributor drive casing by unscrewing the union nuts.

Detach the distributor drive casing complete with the Distributor by removing the two 5/16" BSF Bolts and the two lower nuts & washers.

NOTE. Care must be taken to ensure that the distance piece behind the casing at the bolt location is not mislaid. This is selective for thickness.

Disconnect the throttle and mixture controls from the engine end.

Disconnect the fuel pipe connections from the carburettors.

Detach the return spring on the carburettor control shaft unit and slacken off both fulcrum adjusting screws until the ball ends of the screws are clear of the sockets.

Detach the three carburettors, together with the three joint washers by removing the six 5/16" BSF nuts and spring washers. The H.T. clip can also be removed at this stage.

Detach the two fulcrum brackets and the centre adaptor unit together with the three joint washers by removing the six 5/16" BSF countersunk head screws.

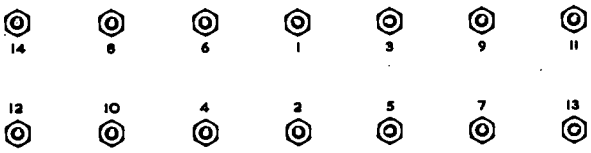
Continuation of procedure after Carburettors have been removed.

Detach the oil transfer pipe connecting the cylinder head and block.

Detach the exhaust pipes from the cylinder head.

Remove the fan belt.

Unscrew and remove the fourteen nuts securing the cylinder head to the block using special spanners N.600121 Box Spanner (with Tommy Bar N.600131) and N.600161 Ring Spanner and the sequence given in Fig. 1 for tightening and loosening the nuts.



C.126.

Fig. 1. Sequence of cylinder head nuts.

Work the cylinder head loose gently and lift off, care being taken to ensure that the push rods remain in position in the block otherwise they may be damaged if caught up in the head.

Remove and discard the Cylinder Head gasket.

Remove the Water Pump. This is not essential but will considerably facilitate the handling of the cylinder head on the bench.

Using special Plug Spanner N.600010 (with Tommy Bar N.600131) remove the sparking plugs.

Detach the rocker covers by unscrewing the eight knurled hand nuts. Remove the joints and the small rubber seals at the ends of the cylinder head.

Detach the seven rocker spindle caps securing each rocker shaft by removing the fourteen special nuts.

Lift out the rocker shafts holding the rockers at each end to prevent them from being pushed outwards against the action of the compression springs. After removal insert a pin into the hole at each end to retain the rockers on the shafts.

Remove the auxiliary push rods.

Using a valve spring lifter compress the valve springs and remove the split valve cotters, the valve springs, the valve spring seatings and the valves.

Important.

All of the parts of this assembly should be retained together and should be assembled back into its identical position at a later date.

With all the valve removed proceed to remove carbon from the combustion and exhaust ports of the cylinder head.

Remove the carbon from the valve guides using a small bristle brush.

Remove the carbon from the valves which should then be polished.

Using a rubber suction cup and suitable 'coarse' and 'fine' valve grinding paste, grind in the valve ensuring that a matt finish is obtained on the valve seatings. Bright rings or any signs of 'pitting' on the seatings would not be good enough.

The maximum width of the seating should be .060 inch Inlet and .080 inch Exhaust and if in excess of this the valve seats should be recut.

When the valves are satisfactory it would be advisable wherever possible to lap the face of the cylinder head. Using a medium grade lapping compound (not coarse which will score the aluminium) on a surface plate lap the face until a good even matt finish is obtained.

The carbon should be removed from the top of the pistons the surrounding cylinder block being carefully covered to prevent the carbon deposit from falling into any part of the engine.

Parts should then be washed thoroughly and all traces of grinding compound or any foreign matter should be removed.

Assembling

All valve springs and rocker compression springs should be carefully examined for fractures or damage. If considered necessary the valve springs could be checked to the figures given in the data of the valve operating group.

Replace the valves back into their original positions in the cylinder head and fit the springs, seatings and cotters. See that the variable pitch valve springs are assembled close-coiled end downwards.

Insert the auxiliary push rods.

Fit the exhaust rocker assembly to the head using assembly plates Fig. 2 and ensure that the spindles locate on the dowel in the front of the cylinder head and with the dowel hole in the shaft. A slot is provided at the rear end of each shaft and a screwdriver can be used to rotate the shaft for positioning. The shaft should then be secured by the seven rocker spindle caps.

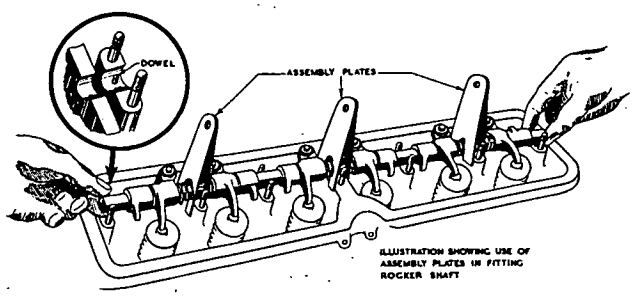


Fig. 2. Rocker shaft assembly showing use of plates.

The Assembly plates can be made up to the dimension given in Fig. 3

The Inlet rocker assembly can be assembled to the head using the same procedure as the exhaust side and finally attached with the seven rocker spindle caps.

Clean and check the sparking plugs which should have a

gap of .018 inch to .020 inch and screw them into the head.

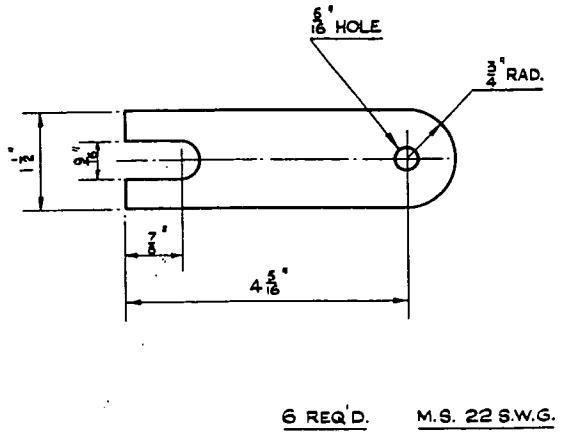


Fig. 3. Assembly plate sketch.

Attach the water pump to the head using new joints slightly smeared with grease.

Before fitting the cylinder head to the block the twelve vertical push rods should be removed and also each of the tappet bodies. Frequently tappets may be removed by hand two holes being provided for a simple hook extractor. However, a carbon deposit may form around the base of the tappet in which case a special extractor tool is illustrated in use at Fig.4 and a fully dimensioned drawing at the end of this Engine Section.

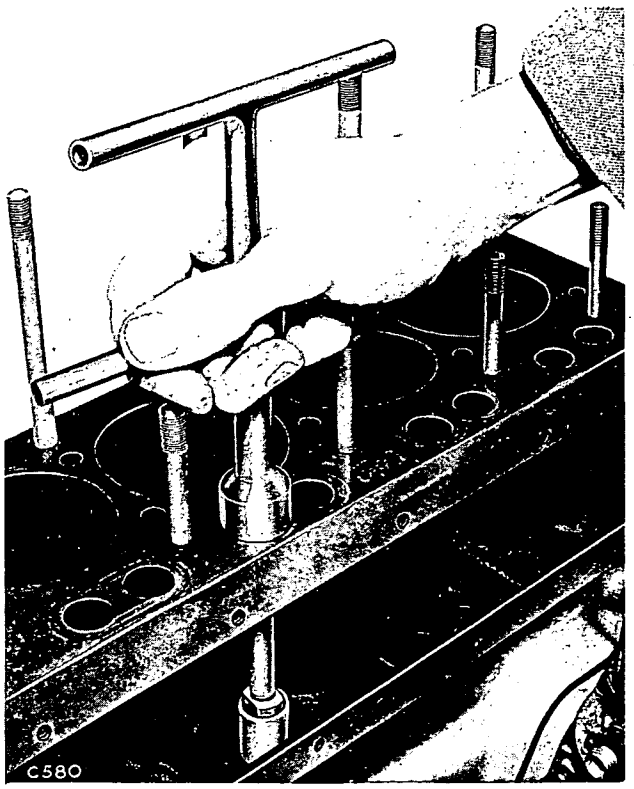


Fig. 4. Tappet withdrawing.

Examine the tappet base and very slight initial pitting which may have taken place early in the life of the engine is not considered to be serious but it is important to examine whether even this slight pitting is deep or whether there is any likelihood of minute pieces having been broken away, in which case a new tappet should be fitted. In all cases of extensive pitting new tappets should be fitted.

Refit the tappets and the vertical push rods.

Fit a new cylinder head gasket and fit the cylinder head to the block, carefully ensuring that the vertical push rods are not damaged or bent as the head is lowered into position.

When the auxiliary and vertical push rods are positioned and the cylinder head is seating on its face, replace and tighten the fourteen holding down nuts gradually using the correct spanners (as for loosening) and the correct sequence given. The nuts should first be tightened so that they are just pinching the head and thereafter one sixth of a turn at a time through the sequence given until all nuts are fully tightened.

A torque loading figure is not considered practical due to the inaccessability of the cylinder head nuts and it is therefore recommended that the correct 'Bristol' ring and box spanners should be used.

The valves can now be adjusted to the correct settings. The correct clearance between the rockers arms and the valve is most important. Valve clearances should be set to .005 when cold. This setting should give a clearance of .012 which should be checked on the Exhaust and Inlet sides when the engine has attained an indicated temperature of 70°C to 75°C.

Turn the engine with the starting handle until No.6 Inlet Valve is fully open. No.1 Inlet Valve will then be fully closed. Slacken the locknut on No.1 Inlet valve rocker screw and adjust the screw to obtain a clearance of .005 between the rocker arm and the face of the valve. See Fig. 5 Hold the adjusting screw, tighten the locknut and recheck. Check the remaining valves in a similar manner. The valve open and closed positions being given on Page 6.

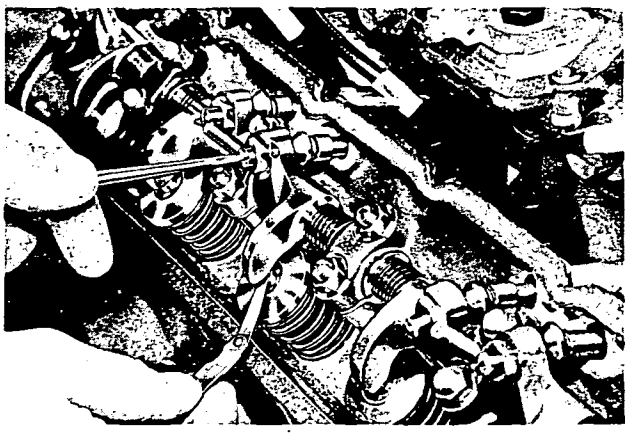


Fig. 5. Tappet adjustment.

When the valve settings have been finally adjusted replace the half round rubber seals in the ends of the

cylinder head. Using new joints assemble the rocker covers into position and secure with the eight hand nuts.

Inlet		Exhaust	
Valve open	Valve closed	Valve open	Valve closed
No.6	No.1	No.6	No.1
No.5	No.2	No.5	No.2
No.4	No.3	No.4	No.3
No.3	No.4	No.3	No.4
No.2	No.5	No.2	No.5
No.1	No.6	No.1	No.6

Valve open and closed positions.

Fit the fan belt and adjust to the correct tension of 1" deflection inwards, by hand, on its upward run see Fig. 6

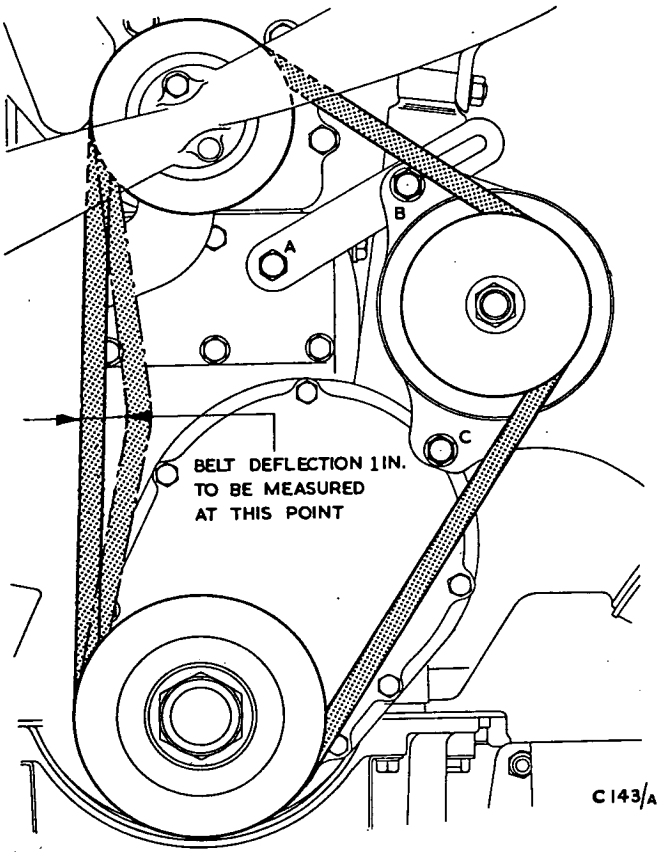


Fig. 6. Fan belt adjustment.

Using new gaskets attach the exhaust manifolds.

Attach the oil transfer pipe connecting the cylinder head with the block.

Attach the carburettors by reversing the procedure given for removing.

Connect the fuel pipe to the carburettors.

Connect the mixture and throttle controls.

Attach the Distributor and its drive shaft assembly to the block and head. Use a new joint on the lower facing and ensure that the driving tongue of the shaft is meshing correctly before tightening the nuts. See also that the selective distance piece is correctly positioned behind the top bolt location before tightening the two bolts Fig. 7

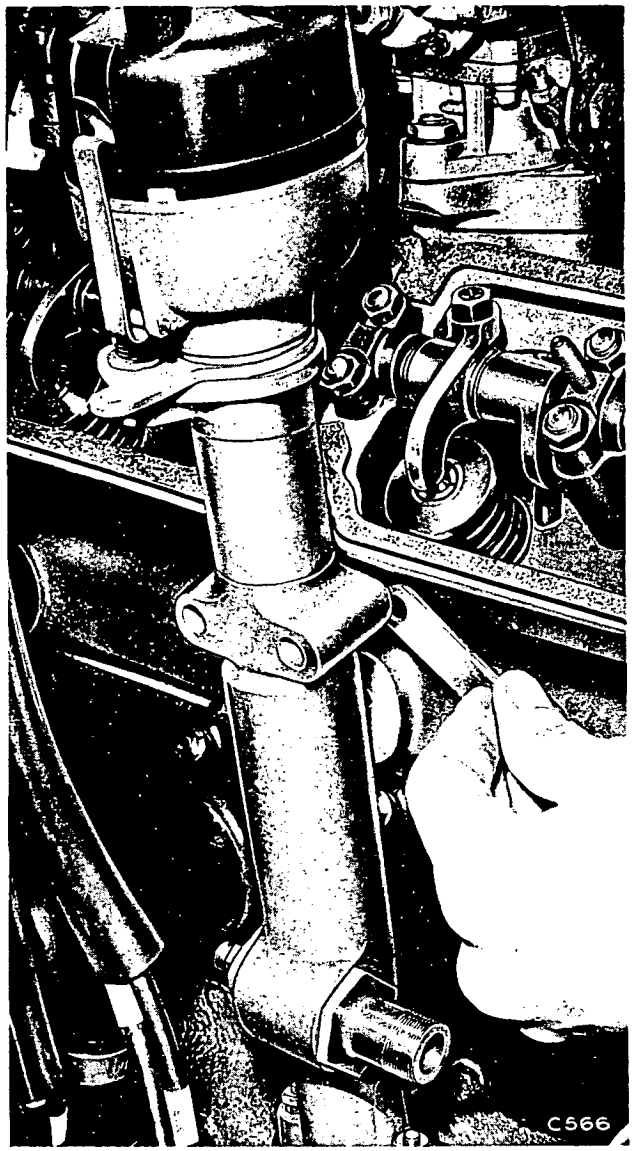


Fig. 7. Distributor drive distance piece.

Check and adjust the contact points to give a clearance of .014 to .016 inch

Attach the spark plug adaptors to the plugs.

Attach the hose connections to the radiator and water pump.

Fill the radiator with water and connect the negative terminal to the battery.

Removing the Engine

Drain the water from the cooling system at the radiator and cylinder block taps.

Disconnect the battery.

Remove the sump drain plug and allow the oil to drain. Refit the plug. Remove the oil temperature thermometer bulb from the sump and stow it, with its capilliary tube on the chassis frame to avoid damage.

Disconnect the leads from the dynamo.

Disconnect the coil H.T. and L.T. leads from the distributor and tie them to the bulkhead clear of the engine.

Disconnect the tachometer drive from rear end of the distributor drive casing.

Disconnect the oil pressure gauge pipe from its union just aft of the dipstick.

Slacken the dynamo mounting and adjusting bolts, press the dynamo as far as possible towards the engine and remove the fan belt. Do not attempt to ride the belt off the pulleys or the core of the belt may be damaged. Retighten the bolts.

Disconnect the mixture control wire.

Turn off the fuel tap to prevent possible tank syphoning and disconnect the flexible pipe from the front of the fuel pump.

Disconnect both Radiator hoses from the water pump and radiator. Disconnect the rear heater connection and remove the copper pipe complete with its connections and the radiator hose. Disconnect the Trico windscreen washer connection from the front of the cylinder head.

Break the locking wire and slacken the exhaust down pipe ring nuts but do not release them.

Disconnect the water thermometer bulb unit from the side of the cylinder block (between the exhaust manifolds) and stow it with the capillary tube on the chassis face to avoid damage.

Remove the vertical throttle control rod (passing through the rear manifold) and replace the nuts on their respective ball joints for safe keeping.

Disconnect the cable from the starter motor.

On earlier cars the radiator has a fixed fan guard jutting out from the header tank and if this should be the case it will be necessary to completely remove the water pump.

On later cars the fan guard of the radiator is detachable. This should be removed and the water pump allowed to remain in position.

Unscrew the ring nuts from the exhaust down pipes. It is advisable to support these pipes to prevent straining the front silencer joints when the lower clip is released subsequently.

Fitting the Engine Sling

Fit the engine lifting sling TFN.5029 to a hoist a convenient height above the engine. Pass the free end of the short (front) cable around the front end of the crankshaft (behind the pulley) and hook it to the front ring of the lifting bar. Pass the free end of the long (rear) cable beneath the sump at the rear just forward of the clutch housing and hook to the rear of the lifting bar. See Fig. 8

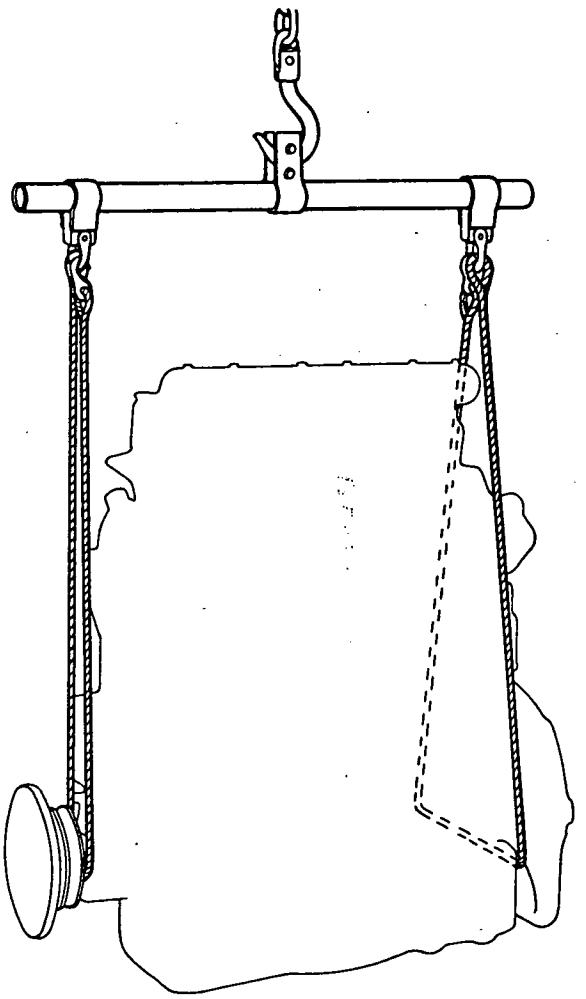


Fig. 8. Engine lifting sling in use.

Raise the hoist until the weight of the engine is taken on the sling.

Remove the gearbox from the car as described in Section 5.

Remove the nuts and bolts securing the front engine mounting blocks to the chassis.

Raise the engine carefully from the car and manoeuvre clear while lifting.

To instal the actual engine reverse the removal procedure.

To instal a replacement engine it should be prepared

for installation in accordance with the removal procedure i.e. removal of the water pump if the radiator has a fixed fan guard and removal of the fan belt with the dynamo in its fullest inward position.

Referring to Modifications in this book it is important to note that an engine with a Viscous damper may not fit into any Type 404 Car or any Type 405 Car up to Chassis 4051. At Chassis 4052 the front cross member and front spring attachment was redesigned to provide clearance for the Viscous Damper.

Engine Assembly Procedure

Assuming that an engine is being completely rebuilt using a new or reconditioned Cylinder Block or Crankshaft then the following sequence of operations should be broadly used. The various operations are dealt with in detail throughout this section of the manual.

With the cylinder block resting on its top face:

(1) Check the crankshaft end float by fitting the crankshaft and a temporary sleeve to the front end.

It is not usual for this end float to be outside of the limits but it is recommended that this is checked should the crankshaft or the block have to be rejected.

(2) Check the camshaft end float.

When these checks have been made and are satisfactory the parts should be removed and the cylinder block thoroughly washed off.

(3) Fit the camshaft and the distributor drive pinion.

(4) Swing the Connecting Rods on the crankshaft journals without the pistons and when satisfactory remove them.

(5) Assemble the pistons to the connecting rods.

(6) Check the piston ring gaps in the bore and assemble to the piston.

(7) Fit the piston and connecting rod assemblies to the block.

(8) Fit the crankshaft.

(9) Fit the drive sprockets, chain, camshaft drive cover and engine damper and assemble the connecting rods to the crankshaft.

(10) Fit the Oil Pump and Sump complete with baffles.

(11) Fit the Flywheel and Clutch Cover assembly.

(12) Reverse the engine to rest on the sump.

(13) Fit the Cylinder Head with the carburettors and Air Filter manifold.

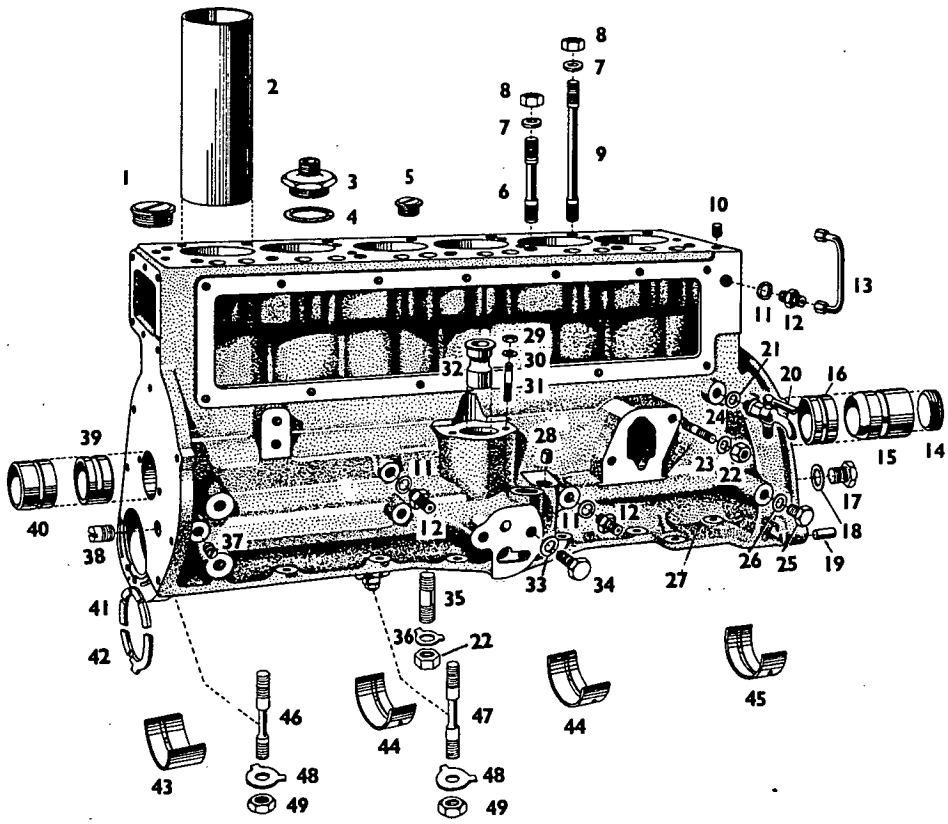
(14) Fit the Distributor Drive assembly and Air Cleaner.

(15) Fit the Oil Filter, Petrol Pump, Sump Breathing System, Dynamo, Starter etc.

Cylinder Block Group

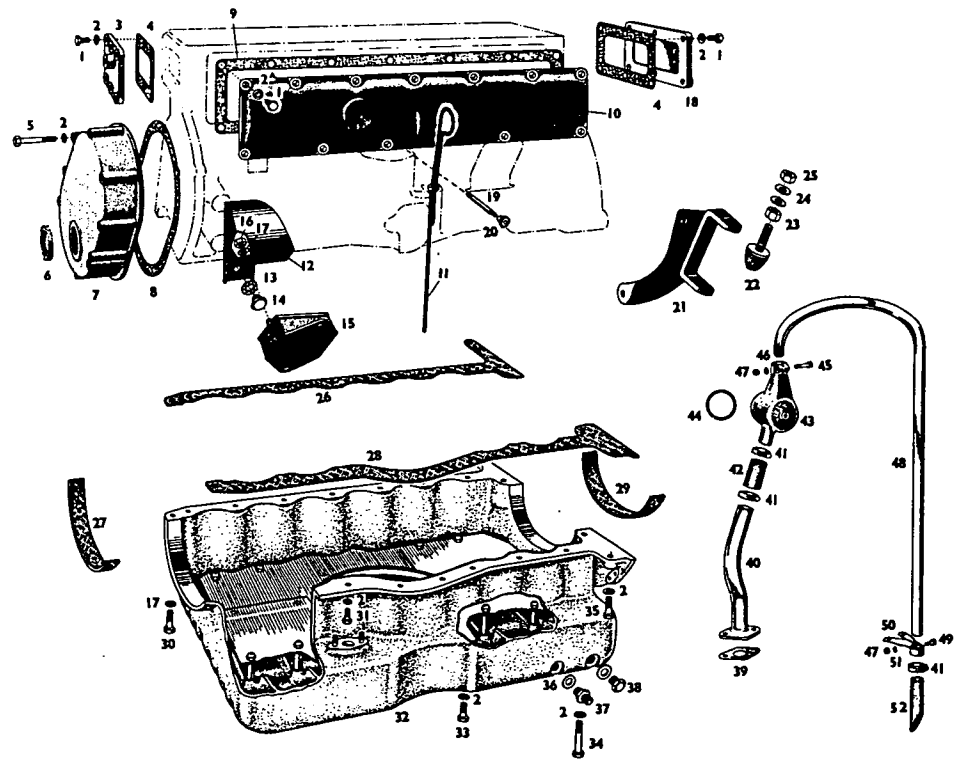
CYLINDER BLOCK GROUP BLOCK. MAIN BEARINGS.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.310480	1	Core Plug - large	1	N.312800	34	Bolt - Oil Cleaner	2
N.312750	2	Cylinder Liner	6	N.312600	35	Stud - Oil Pump	2
N.311540	3	Thermo Union	1	N.310380	36	Tabwasher - Oil Pump	2
N.311760	4	Thermo Union Washer	1	FBS.361/J	37	Blank Plug - Oil Gallery	1
N.310490	5	Core Plug - small	2	FBS.361/P	38	Blank Plug - Oil Gallery	1
N.314560	6	Stud - Cyl. Head Securing - short	7	N.311360	39	Camshaft Bearing - Mid-Front	1
N.312420	7	Washer - Cylinder Head	14	N.312410	40	Camshaft Bearing - Front	1
N.311680	8	Nut - Cylinder Head	14	N.313590	41	Thrust Plate - Top Half	2
N.314550	9	Stud - Cyl. Head Securing - long	7	N.313770	-	Thrust Plate - Top Half + .0025 thickness	-
FBS.361/G	10	Blank Plug	1	N.313790	-	Thrust Plate - Top Half + .005 thickness	-
N.310910	11	Washer (Union)	3	N.313600	42	Thrust Washer - Bottom Half	2
N.311730	12	Union	3	N.313780	-	Thrust Washer - Bottom Half +.0025 thickness	-
N.311520	13	Oil Transfer Pipe Unit	1	N.313800	-	Thrust Washer - Bottom Half + .005 thickness	-
N.311420	14	Blank Plug - Camshaft Bearing	1	N.313130	43	Main Bearing - Front Starboard	2
N.310680	15	Camshaft Bearing - Rear	1	N.313220	-	Main Bearing - Front .010 Undersize	-
N.311370	16	Camshaft Bearing - Mid-Rear	1	N.313230	-	Main Bearing - Front .020 Undersize	-
FS.109/4D	17	9/16" Setscrew	1	N.314470	-	Main Bearing - Front .030 Undersize	-
N.310510	18	Alum. Washer	1	N.314480	-	Main Bearing - Front .040 Undersize	-
FBS.379/G6	19	Dowel - Bearing Cap & Clutch Casing	10	N.313940	44	Main Bearing - Centre - Starboard	4
N.312010	20	Drain Tap	1	N.314320	-	Main Bearing - Centre .010 Undersize	-
FBS.515	21	Washer - Drain Tap	1	N.314330	-	Main Bearing - Centre .020 Undersize	-
FN.105/L	22	Nut - Petrol Pump & Oil Pump	4	N.314510	-	Main Bearing - Centre .030 Undersize	-
AGS.585/E	23	Spring Washer - Petrol Pump	2	N.314520	-	Main Bearing - Centre .040 Undersize	-
N.312580	24	Stud - Petrol Pump	2	N.313930	45	Main Bearing - Rear - Starboard	2
N.310450	25	Blank Plug - Oil Gallery	2	N.314300	-	Main Bearing - Rear .010 Undersize	-
N.310460	26	Washer - Blank Plug - Oil Gallery	2	N.314310	-	Main Bearing - Rear .020 Undersize	-
N.313370	27	Cylinder Block Unit	1	N.314490	-	Main Bearing - Rear .030 Undersize	-
N.311580	28	Bush - Dipstick	1	N.314500	-	Main Bearing - Rear .040 Undersize	-
FN.104/L	29	Nut - Distributor Bracket	2	N.313580	46	Stud - Main Bearing - Front	2
AGS.585/D	30	Spring Washer - Distributor, Bracket	2	N.312680	47	Stud - Main Bearing	6
N.312590	31	Stud - Distributor Bracket	2	N.310360	48	Tabwasher - Main Bearing	8
N.310710	32	Distributor Drive Gear Bush	1	N.312700	49	Nut - Main Bearing	8
AGS.585/F	33	Spring Washer	2				



CAMSHAFT DRIVE COVER SUMP

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
WS.104/5D	1	Setscrew - Push Rod Cover	25	N.310160	27	Joint - Front - Sump	1
AGS.585/D	2	Spring Washer	48	N.313280	28	Joint - Inlet Side - Sump	1
N.430371	2A	Fibre Washer	13	N.312360	29	Joint - Rear - Sump	1
N.311130	3	Blanking Plate - Front	1	WS.105/10D	30	Setscrew - Sump Rear	2
N.311140	4	Gasket - Blanking Plate	2	N.312640	31	Bolt - Sump	15
WB.104/17D	5	Bolt - Camshaft Drive Cover	8	N.313150	32	Sump Unit	1
N.312550	6	Felt Washer	1	WB.105/10D	33	Bolt - Sump - Rear	1
		Used up to Chassis 4136		WB.105/18D	34	Bolt - Sump - Rear	2
N.313910	-	Felt Washer	1	WB.105/8D	35	Bolt - Sump - Rear	1
		Used on and after Chassis 4137		FBS.517	36	Washer - Thermo Union	1
N.311181	7	Camshaft Drive Cover	1	N.314450	37	Magnetic Drain Plug complete with Washer	1
		Used up to Chassis 4136		N.312240	38	Thermo Union	1
N.314440	-	Camshaft Drive Cover	1	N.313320	39	Sump Pipe Gasket	1
		Used on and after Chassis 4137		N.313630	40	Drain Pipe - Separator Box to Sump	1
N.311170	8	Joint - Camshaft Drive Cover	1	-	41	Clip - Jubilee No.1	3
N.310200	9	Joint - Push Rod Cover	1	N.313690	42	Hose - Drain from Separator	1
N.313410	10	Push Rod Cover	1	N.313650	43	Separator Box	1
N.310930	11	Dipstick Unit	1	N.313700	44	Joint Washer - Rubber	1
N.314540	12	Dipstick Unit - LHD Cars only	1	FB.104/12D	45	¼" BSF Bolt	1
N.311490	12	Mounting Bracket - Nearside	1	-	46	¼" Shakeproof Washer	1
N.311500	-	Mounting Bracket - Offside	1	FN.104/L	47	Nut ¼" Hex.	2
-	13	7/16" Shakeproof Washer	4	N.314280	48	Extractor Pipe R.H.D.	1
FS.107/6D	14	7/16" BSF Setscrew	4	N.314290	-	Extractor Pipe L.H.D.	-
N.311270	15	Mounting Block	2	FB.104/8D	49	Bolt ¼" BSF	1
FN.105/L	16	5/16" BSF Nut	4	N.313740	50	Clip complete	1
AGS.585/E	17	Spring Washer	8	-	51	¼" Spring Washer	1
N.312370	18	Blanking Plate - Rear	1	N.313710	52	Hose - Extractor Pipe	1
N.313670	19	Stud for Separator Box	1				
N.313660	20	Retaining Nut	1			On later Engines a long Dipstick was	
N.311220	21	Torque Buffer Bracket	1			introduced together with a Clip and	
N.311280	22	Torque Buffer	2			Revised Extractor pipe	
FN.107/L	23	7/16" BSF Nut	2				
AGS.585/G	24	Spring Washer	4	N.314650	-	Dipstick	1
FN.207/L	25	7/16" BSF Locknut	2	N.314660	-	Clip	1
N.313290	26	Joint - Exhaust Side - Sump	1	N.314640	-	Extractor Pipe	1



Cylinder Block Group

General Data

Material	Cast Iron.
Cylinder Liners	'Brivadium Dry'
Interference of Liner in Bore	.003 to .004 inch (0.080 to 0.1 m/m)
Load required to press in Liners	4 to 6 tons. (4.06 to 6.09 tonnes)
Finished Bore size	Controlled by Piston See Piston Clearance. Crankshaft Group.
Camshaft Bearing Material	Phosphor Bronze

Camshaft Bearing location in Piston Block.

Front	1.675 + .0007 inch. (42.55 + .018 m/m)
Mid-Front	1.695 + .0007 inch. (43.05 + .018 m/m)
Mid-Rear	1.715 + .0007 inch. (43.55 + .018 m/m)
Rear	1.735 + .0007 inch (44.05 + .018 m/m)

Interference fit of Camshaft Bearings in Cylinder Block.

Front, Mid-Front & Mid-Rear	.0016 inch to .0028 inch. (.04 m/m to .07 m/m).
Rear	.0026 inch to .0038 inch. (.065 m.m to .096 m.m).

Finished Bore of Camshaft Bearings.

Front	1.460 + .001 inch. (37.084 + .025 m/m).
Mid-Front	1.440 + .001 inch. (36.576 + .025 m/m).
Mid-Rear	1.420 + .001 inch. (36.068 + .025 m/m).
Rear	1.260 + .001 inch. (32.00 + .025 m/m).

(see sectional view of Cylinder Block)

Replacements

Service replacement Cylinder Blocks are available from the manufacturer. They are supplied subject to the return of the removed cylinder block which is accepted for normal wear only. Cracked cylinder blocks, even considered repairable, are not accepted in exchange.

A works reconditioned cylinder block is supplied complete with all bushes and studs and with the exception of the insertion of some studs (omitted for transport purposes) the block is ready to fit to the engine. If pistons are required they should be ordered with the replacement block in order to control the specified piston clearance.

Reboring

Cylinder liners may be rebored to one oversize only which is .010 above nominal size and pistons are available for this size. For general checking purposes, to see if the bore will 'clean up' a size of 2.608 inch (66.254 m/m) should be used but the finished bore should be honed to give the specified piston clearance. See Re-sleeving.

Re-Sleeving

The cylinder liners can be removed by two methods.

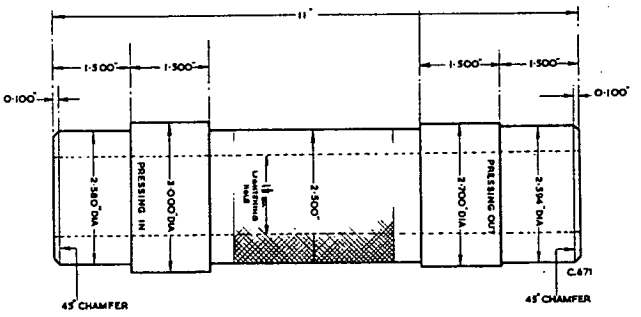


Fig. 9. Spigot for removing liners.

(A) Using a hand press only and a special spigot Fig. 9 as illustrated in Fig.10

(B) By offsetting the bore in boring machine and cutting down the side of the liner until it can be collapsed and taken out. It should be noted that the wall thickness is only approximately .050 inch (1.27 m.m) when new and careful boring is necessary to avoid cutting past the liner into the cylinder block.

Fitting New Cylinder Liners

Check the cylinder bores and if necessary carefully stone any scores.

Check the internal diameter of the bore and the external diameters of the new liner to ensure that the recommended interference given in General Data is obtained.

Lightly oil the cylinder bore and the external surface of the liner and with the assembly beneath the ram of a press capable of exerting the load given in General Data, press the liner steadily into the cylinder bore until level with the cylinder block face. See Fig.10

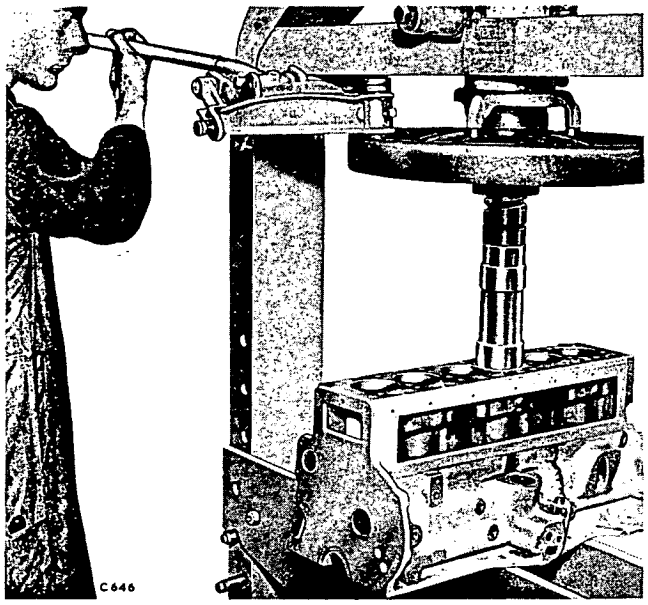


Fig. 10. Removing and refitting cylinder liners.

After fitting the liners, skim grind the top face of the block to ensure a flat face.

Carefully blend each valve head cut-away, to a good surface finish, to conform with that of the cylinder block. See Fig.11 Machine the two connecting rod clearance slots, in each liner, inside the cylinder block.

Bore and hone the liner to give the correct Piston clearance as follows:

Clearance in cylinder bore checked cold on thrust face at bottom of skirt.	.0022 to .0026 inch (.056 to .066 m/m)

Finally attention should be paid to the cleanliness of the block and in particular to the oilways.

Camshaft Bearings

If resleeving of the Cylinder Block is being carried out due to normal wear then it would follow that the Camshaft bearings would need attention. Check the bores as given in General Data and if the clearance for the camshaft journals is in excess of .002 to .003 inch (.051 to .076 m/m) they should be replaced to avoid low oil pressure.

To replace the bearings proceed as follows:

(1) Unscrew the blanking plug from the rear bearing.

(2) Using a suitable drift, drive out the bearings.

(3) Check that each bearing location is clean and free from scores and burring.

(4) Check the outer diameter of each new bush and its relevant bore in the cylinder block to ensure that the correct interference is obtained. See General Data.

Camshaft Bearings .002 (.051 m/m) oversize on the

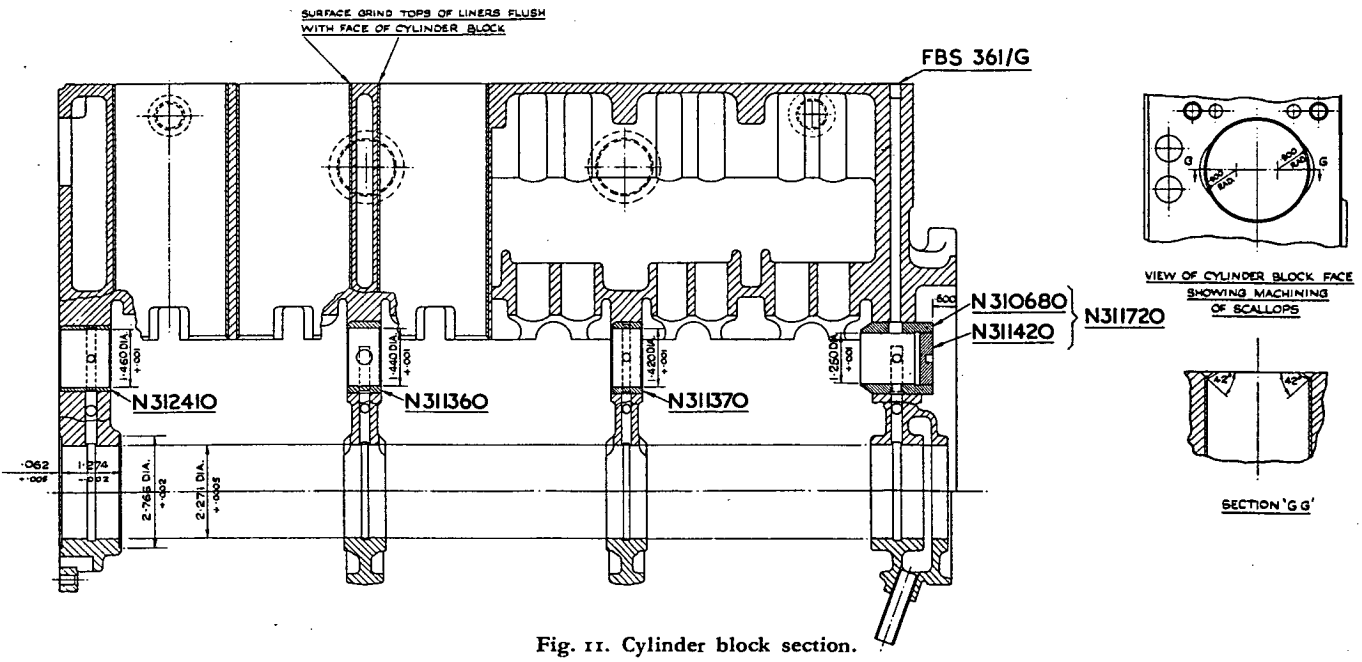


Fig. 11. Cylinder block section.

outside diameter are available although not listed in the Spare parts.

(5) To insert a bearing, freeze for 5 to 10 minutes and insert them, chamfered end towards the front of the block in each instance. If necessary use a soft metal drift to tap them into position.

When fitting the mid-front bearing, make certain that the oil holes are aligned correctly with the holes in the block, the larger hole must align with the oil feed port at the bottom and the smaller hole with the port towards the outer wall of the block.

When fitting the rear bearing ensure that the larger hole is aligned with the oil feed port at the top.

See Sectional view of Cylinder Block Fig.11

Sizing the Camshaft Bearings

At the works the bearings are reamered to size using a hand line reamer comprising of the arbor T.181646 and the four detachable reamers T.185379-81 and 82 given in a fully dimensioned drawing at the back of this Section.

Where reamering facilities are not available the bearings should be scraped to size using the camshaft for alignment and finally checking with actual camshaft diameters to see that the correct running clearance is obtained. See Fig.12

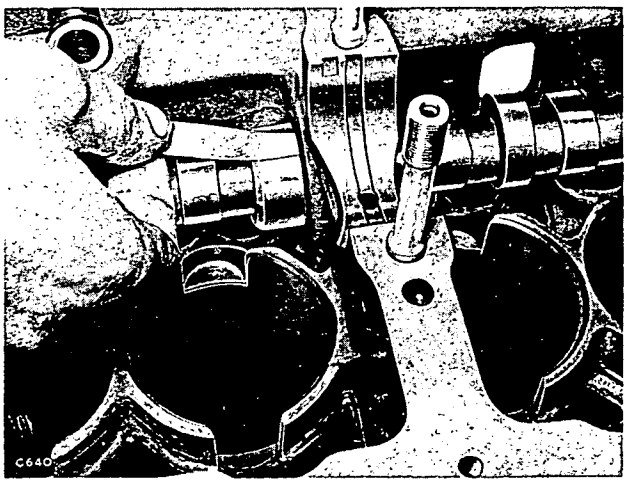


Fig. 12. Camshaft. clearance.

Whichever operation takes place it is essential that particular attention is paid to the cleanliness of the oil-ways to the extent of unscrewing the plugs of the oil galleries.

Fit a new blanking plug to the rear camshaft bearing as follows. Coat the threads of the plug with jointing compound and screw in the plug leaving 1.1/2 to 2 threads standing proud. Lightly peen the plug around the thread root diameter. Screw the plug further in until about 1 thread is proud then peen again to lock it firmly.

Replacing Bearing Caps

Bearing caps are not supplied as spares as they are fitted to the cylinder block and line bores in position being finally stamped for identification and position on each block. A bearing cap from any one position would not interchange from block to block.

However in the event of loss or breakage a bearing cap, unfinished in the bore, but machined ready to attach to the block can be supplied.

The block would then have to be set-up in a boring machine and accurately bored to the existing half bore in the cylinder block. See the sectional view of the Cylinder Block Fig.11 and do not bore above the size given in order to retain the correct fit for the shell bearings.

Replacing Distributor Drive Bushes

Bushes for this location in the cylinder block are supplied to size. The existing bush can therefore be driven out and a new bush inserted by freezing or carefully driving into position with a suitable soft drift.

Sump

Removing (engine installed) See Fig.13

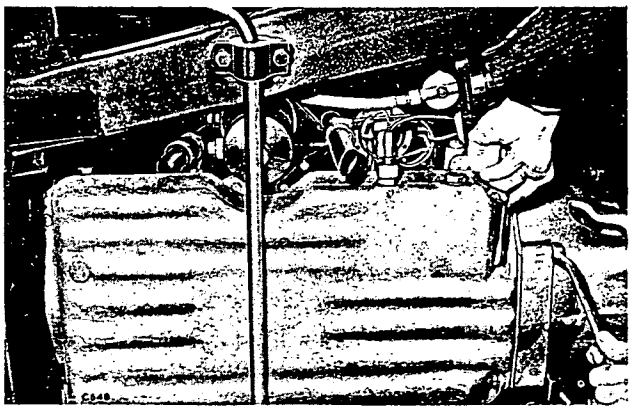


Fig. 13. Sump removing.

Remove the drain plug from the sump allow the oil to drain and refit the plug.

Remove the nuts of the lower bolts securing the clutch casing to the sump flange and detach the exhaust pipe clip on the right hand side and the lower fixture of the torque buffer bracket on the left.

Remove the two nuts and washers securing the oil separator to sump pipe and slacken the pinch bolt of the oil separator to atmosphere sufficiently to slide within the clip.

Unscrew the union nut and withdraw the oil thermometer bulb from its location forward of the sump drain plug. Take care to prevent damage to the bulb and capillary tube and ensure that the small joint washer is not lost.

Remove the nut and bolt securing the upper end of the torque buffer bracket, pull the buffers clear of the chassis frame and remove.

Remove the nuts and spring washers securing each anti-roll bar attachment to the chassis and allow the anti-roll bar to hang downwards.

Remove the nineteen set-bolts and spring washers from the sump flange and move the separator pipe bracket clear.

Lower the rear end of the sump and pull its rearwards and downwards clear of the engine.

It may be more convenient to remove the oil filter during this operation but this is not essential.

Finally remove and discard the four sump face joints.

Refitting

Before refitting the sump ensure absolute cleanliness of the sump flange face and its corresponding face on the engine.

Apply an even coating of good quality jointing compound to the joint faces of the sump and allow it to set "sticky".

Fit two new side joints and press firmly into position, followed by new joints at each end, approximately 1/8" inch (3.18 m/m) of each side of the end joints should stand proud of the side joints. This surplus should remain in order to obtain a tight seal when the joints are compressed into position.

If necessary fit a new joint at the flange attachment of the separator pipe.

Smear an even quantity of grease over the exposed surfaces of the sump joints and offer up the sump into position on the engine.

Locate the separator pipe flange on the studs in the sump.

Fit the nineteen set bolts and spring washers and, with the separator pipe bracket in its correct position, tighten the bolts evenly.

Fit the nuts and spring washers to the separator pipe flange and tighten. Tighten the pinch bolt of the separator box.

Refit the torque buffer mounting bracket to the left hand side and the bolts to the right hand side with the exhaust pipe support clip and tighten securely.

Fit the oil thermometer bulb with its sealing washer and secure it with the union nut.

Position the anti-roll bar and secure the attachments.

Refill the sump to its correct level with the recommended oil.

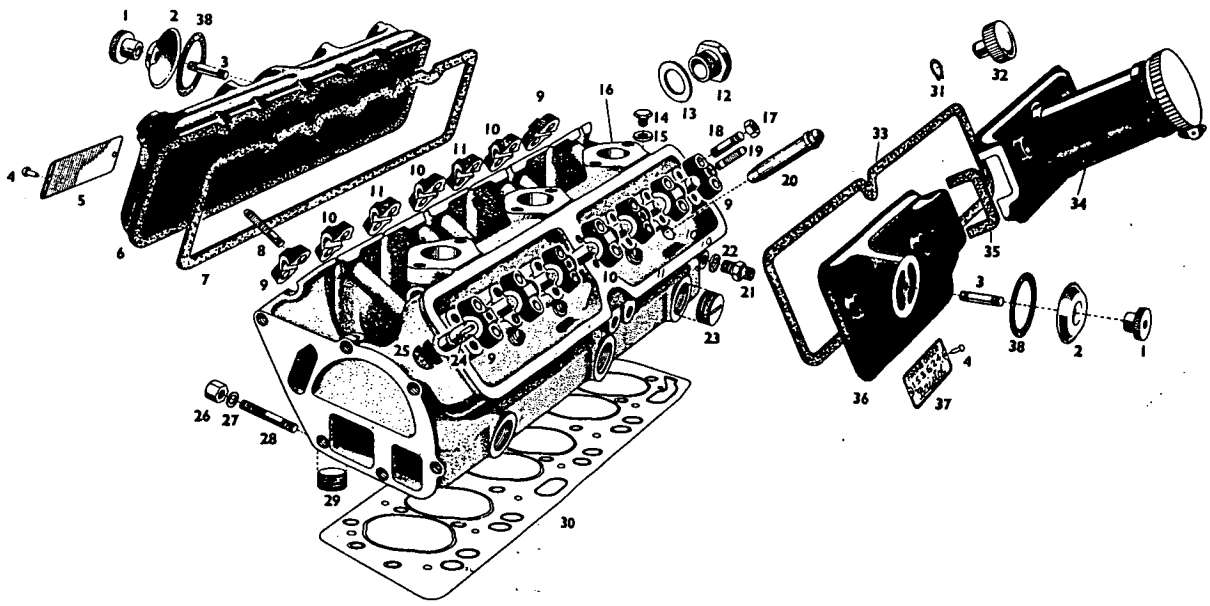
After running the engine for a while, check the joints for satisfactory fitting.

To remove and refit the sump with the engine removed from the car refer to the appropriate paragraphs of the foregoing procedure with engine installed.

Cylinder Head and Valve Operating Group

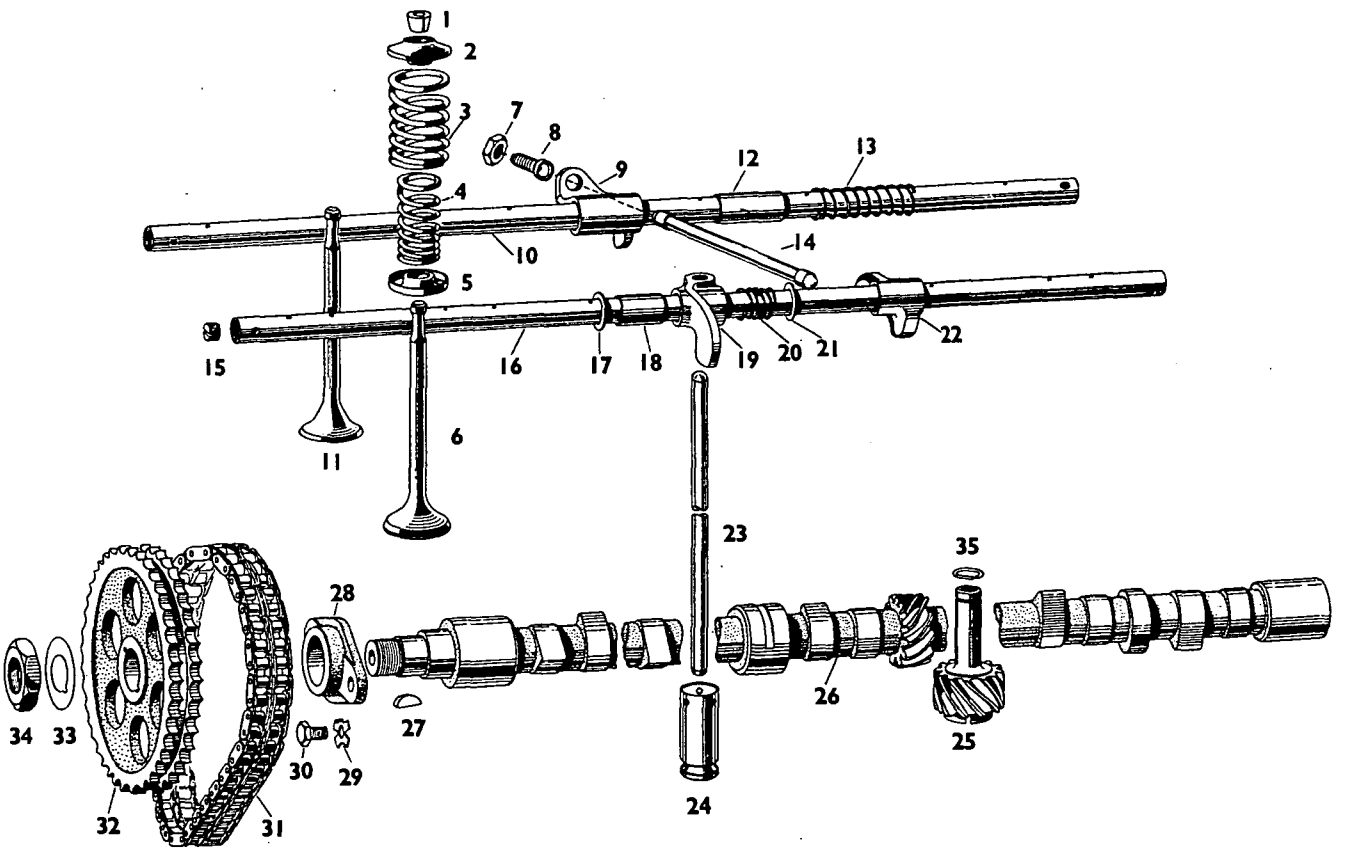
CYLINDER HEAD GROUP

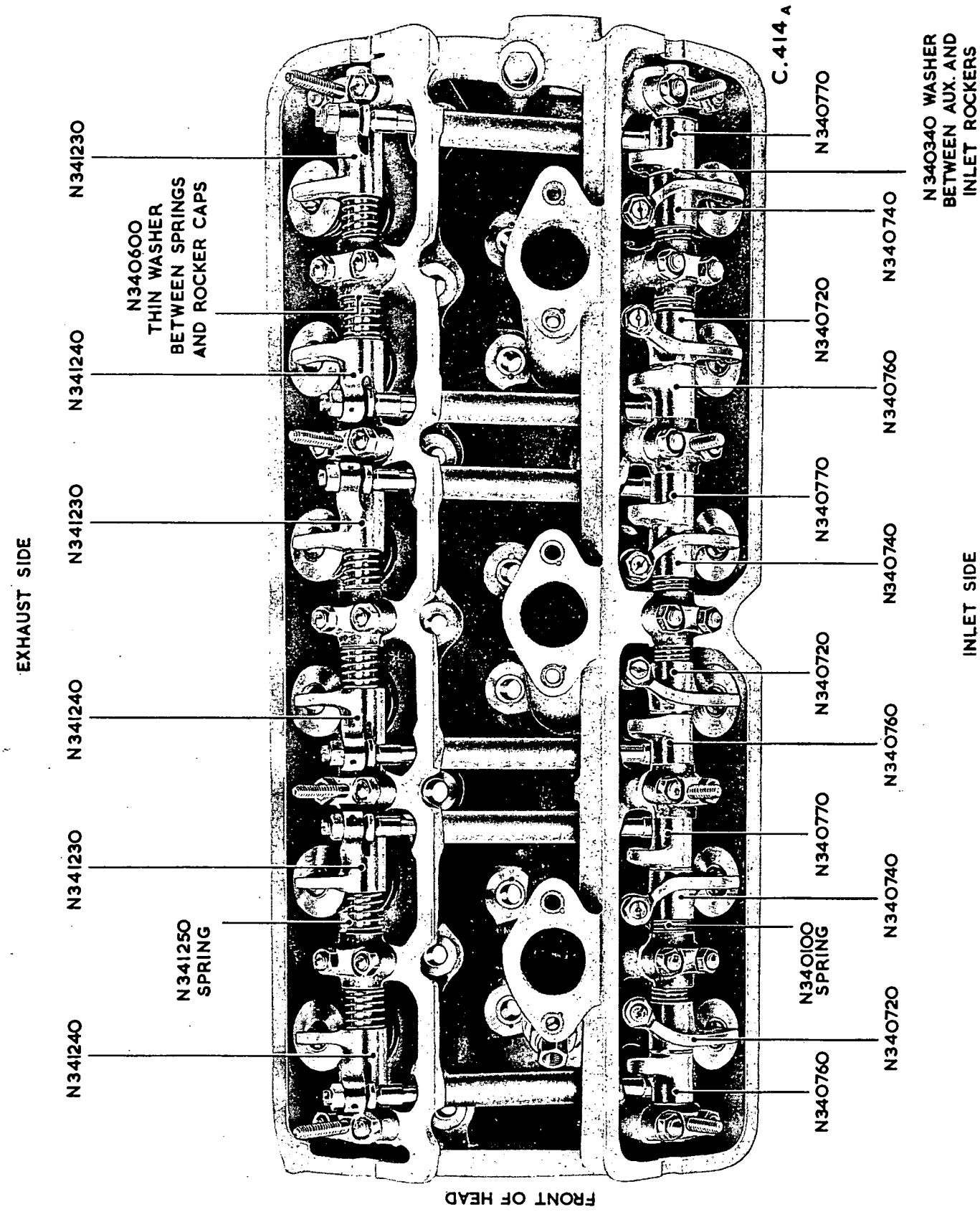
Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.320310	1	Nut - Blanking Plate	2	N.321580	-	Valve Guide + .010 o/d	-
N.320740	2	Blanking Plate	2	N.322230	-	Valve Guide + .030 o/d	-
N.321780	3	Stud - Blanking Plate	2	N.311730	21	Union - Oil Transfer	1
N.321360	4	Rivet - Snap Head	4	N.310910	22	Washer - Oil Transfer	1
	5	Engine Number Plate	1	N.320150	23	Core Plug - Large	3
N.321080	6	Cover - Rocker Box - Exhaust	1	FBS.579/B4	24	Dowel - Rocker Spindle	2
N.321330	7	Joint - Rocker Box - Exhaust	1	N.320110	25	Seal - Rocker Box	4
N.321730	8	Stud - Rocker Spindle Cap	4	N.370060	26	Nut - Exhaust Manifold	8
N.320170	9	Rocker Spindle Cap	4	AGS.585/E	27	Spring Washer	8
N.320190	10	Rocker Spindle Cap	6	N.321750	28	Stud - Exhaust Manifold	8
N.320200	11	Rocker Spindle Cap	4	N.320160	29	Core Plug - Small	2
N.321110	12	Plug	1	N.322880	30	Gasket - Cylinder Head	1
FBS.537	13	Washer	1	(N.321980)			
FS105/3D	14	Setscrew	1	N.320220	31	Circlip - Retaining Nut	8
N 320460	15	Washer	1	N.321640	32	Retaining Nut	8
N.322690	16	Cylinder Head Unit (100 B Engine)	1	N.321970	33	Joint - Rocker Box - Inlet	1
N.322080	-	Cylinder Head Unit (100 B2 Engine)	-	N.321001	34	Inlet - Rear - Rocker Box - Cover	1
N.320340	17	Nut - Rocker Spindle Cap	28	N.321310	35	Joint - Rocker Box Section	1
N.321770	18	Stud - Rocker Spindle Cap	28	N.320071	36	Inlet - Front - Rocker Box Cover	1
N.321710	19	Stud - Rocker Spindle Cap	4	N.320850	37	Plate - Ignition Timing	1
N.321381	20	Valve Guide - Std. Size	12	N.320300	38	Joint - Breather Pipe	2



VALVE OPERATING GROUP

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.340300	1	Valve Cotter - in halves	12	N.340720	19	Inlet Rocker Unit R.H. Bushed	3
N.340280	2	Spring Seating - Upper	12	N.340740	-	Inlet Rocker Unit L.H Bushed	3
N.341560	3	Valve Spring - Outer	12	N.340100	20	Compression Spring - Short	6
N.341550	4	Valve Spring - Inner	12	N.340340	21	Washer	6
N.340620	5	Spring Seating - Lower	12	N.340760	22	Aux. Rocker Unit L.H. Bushed	3
N.340880	6	Inlet Valve	6	N.340770	-	Aux. Rocker Unit R.H. Bushed	3
N.341260	7	Locknut	12	N.342140	23	Push Rod Unit. (Also N.342250)	12
N.341700	8	Rocker Adjusting Screw	12	N.341710	24	Tappet	12
N.341240	9	Exhaust Rocker Unit R.H. (Bushed)	3	N.340330	25	Distributor & Oil Pump Drive Pinion	1
N.341230	-	Exhaust Rocker Unit L.H. (Bushed)	3	N.341800	26	Camshaft	1
N.340840	10	Exhaust Rocker Spindle	1	N.332620	27	Key	1
N.341510	11	Exhaust Valve	6	N.340420	28	Retaining Plate - Camshaft	1
N.340310	12	Rocker Bush	6	N.341210	29	Tabwasher	2
N.341250	13	Compression Spring - Long	6	WS.104/4D	30	Setscrew ¼" dia. x ½" long	2
N.342390	14	Aux. Push Rod Unit	6	N.340580	31	Chain	1
N.340650	15	Rocker Spindle Plug	4	N.342000	32	Chain Wheel	1
N.341220	16	Inlet Rocker Spindle	1	N.340440	33	Washer	1
N.340600	17	Washer - Rocker Spindle	12	N.340430	34	Nut	1
N.340140	18	Rocker Bush	12	N.340830	35	Circlip	1





Plan view of cylinder head showing the inlet and exhaust rocker assembly

Cylinder Head and Valve Operating Group

General Data

Cylinder Head

Material.	Aluminium Alloy.
Valve Seats.	Shrunk in 'Brimol' inserts.
Valve seat angle.	45°
Valve seat location bore in head	.4787 + .0005 inch. (12.159 + .013 m/m).
Interference fit of valve guide in Cylinder Head	.0008 to .0018 inch. (.02 to .04 m/m).

Valve Guides and Valve stems-Inlet and Exhaust.

Valve Guide bore diameter	.3125 inch (7.94 m.m)
Valve Stem diameter	.3105 inch (7.89 m/m)
Desired Clearance between valve stem and guide-cold	.002 to .0028 inch (.05 to .07 m/m)
Inlet and Exhaust Valve Seat Angle.	45

Valve Springs-Outer - N.341560.

Free length.	1.678 (42.85 m/m)
Length when loaded to 54 ± 4 lb.	1.028 inch (26.111 m/m)
(24 .5 ± 1.8 Kg)	

Valve Springs-Inner N.341550

Free length	1.625 inch (41.275 m/m)
Length when loaded to	
47.5 ± 4 lb. (20.6 ± 1.8 Kg.)	1.028 (26.111 m/m)

Rocker Spindle and Rockers.

Rocker Spindle diameter	.509 inch (12.93 m/m)
Rocker Bush Bore diameter	.510 inch (12.95 m/m)
Desired clearance between Spindle and Bush	.001 to .0018 inch (.03 to .04 m/m)

Tappets

Bore in Cylinder Block	.787 + .0005 inch (19.99 + .01 m/m)
Tappet outside diameter	.7865 - .0005 (19.96 - .01 m/m)
Tappet in Cylinder Block desired clearance.	.0005 to .0015 inch (.01 to .038 m/m)

Cylinder Head Replacements

Service replacement Cylinder Heads are not available from the manufacturer. In the event of cracking on the face between the combustion chambers or corrosion of the water holes the cylinder head can be sent to the manufacturer, by arrangement, for possible repair. No liability can be accepted for this work as after pre-heating, welding, machining and final pressure testing the head may be considered as scrapped.

In the event of cracking within the combustion chambers the head should be considered as scrap.

Replacement of Valve Seats

In the event of the 'Brimol' valve seats needing replacement the head should be returned to the manufacturer wherever possible. Where it is not practicable to return the head oversize seats are available but they will only be issued without liability and on request only.

They are shrunk into position and torque tested with special tools and equipment.

Fitting Replacement Valve Guides

Replacement valve guides are available as follows:

N.321381	Valve Guide-Std. .481 inch o/d.
N.321580	Valve Guide +.010 inch o/d.
N.322230	Valve Guide +.030 inch o/d.
N.322850	Valve Guide +.040 inch o/d (Rough turned).

Remove the old valve guide from the head with a stepped drift and a hammer. Should they be tight the bore should be drilled out carefully to reduce the wall thickness as the soft aluminium of the head can easily pick-up and score badly.

To fit a new guide first measure the bore in the head and check with the figures given in General Data of this section. In many instances a standard valve guide will prove satisfactory particularly if the old guide has been carefully removed.

Do not attempt to ream or enlarge the bore in the cylinder head or mal-alignment will occur.

Should a standard guide be too small select an oversize valve guide and grind the outside diameter to give the correct interference fit required.

It is preferable to freeze replacement guides for insertion but failing this the guide should be drifted carefully into position.

The bore of the valve guide is in all instances supplied in a broached finished size and if fitted correctly should accept the valve stem to give the desired clearance.

Replacing Rocker Bushes

Press out, rather than drift out, the existing bushes.

Replacement bushes are supplied undrilled. After pressing new bushes into position they should have the oil holes drilled through the bush from the rocker. At the ends of the rocker are half round oilways approximately .020 inch deep. The new bushes should be filed out to conform to these grooves.

The bores of the new bushes will be tight to a new spindle and should be scraped or reamed out to the figure given in the General Data of this section.

The tightness of the bores however may be used to advantage on a worn spindle.

For Removal, Dismantling and re-assembly of the Cylinder Head see DECARBONIZING.

For the inspection and replacement of tappets see DECARBONIZING.

Valve Timing

Checking the valve timing should be carried out using the Valve Timing Diagram Fig.15 shown overleaf.

On Type 404 Engines and on Type 405 Engines up to Chassis 4066 it will be necessary to determine the T.D.C. positions as described in IGNITION TIMING.

On Type 405 Cars Chassis 4067 onwards provision has been made for checking the valve timing by clear markings on the flywheel at 10° before T.D.C. and also at T.D.C. These markings can be positioned using a central marking on an aperture which is located at the top right hand side of the clutch housing and is covered by a swing cover.

Replacing the Timing Chain

This cannot be carried out with the engine installed in the car, it is therefore recommended that the chain is replaced at overhaul intervals rather than running it to the limits of its life and thus destroying the timing wheel and sprocket tooth formation.

If however the chain has to be replaced remove the engine, remove the camshaft drive cover and dismantle the front of the crankshaft and camshaft as given in the crankshaft and the camshaft groups. The engine need not be inverted.

Camshaft

Removing

With the engine removed from the chassis, remove the cylinder head and the distributor drive. Remove the push rod cover and extract the vertical push rods and the tappets.

Remove the engine damper and carrier pulley with the camshaft drive cover.

Detach the sump and from inside remove the circlip from the spindle of the distributor and oil pump drive pinion. Withdraw the pinion from the top through the distributor drive casing aperture.

Remove the chain wheels together with the chain and remove the camshaft retaining plate.

The camshaft can then be removed from the front of the block.

Refitting the Camshaft

Fit the camshaft and check the clearance in the bores as shown in Fig.12 This should be .002 inch to .003 inch and any excess of this would result in loss of oil pressure.

Check the end float by temporary attaching the camshaft retaining plate and tightening the two setscrews. Fit the chain wheel and tighten the retaining nut. Check the end float as shown in Fig.14 which should be .004 inch to .0062 inch.

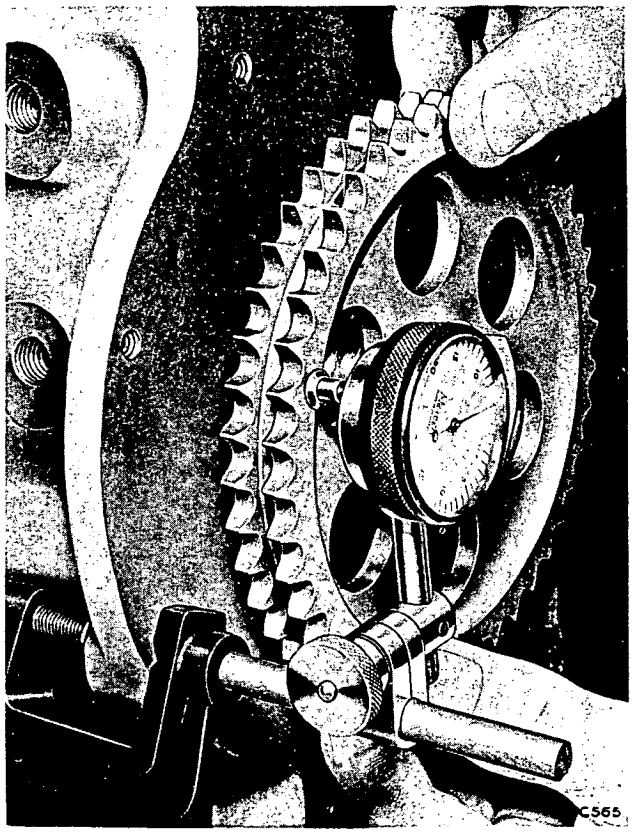


Fig. 14. Camshaft end float.

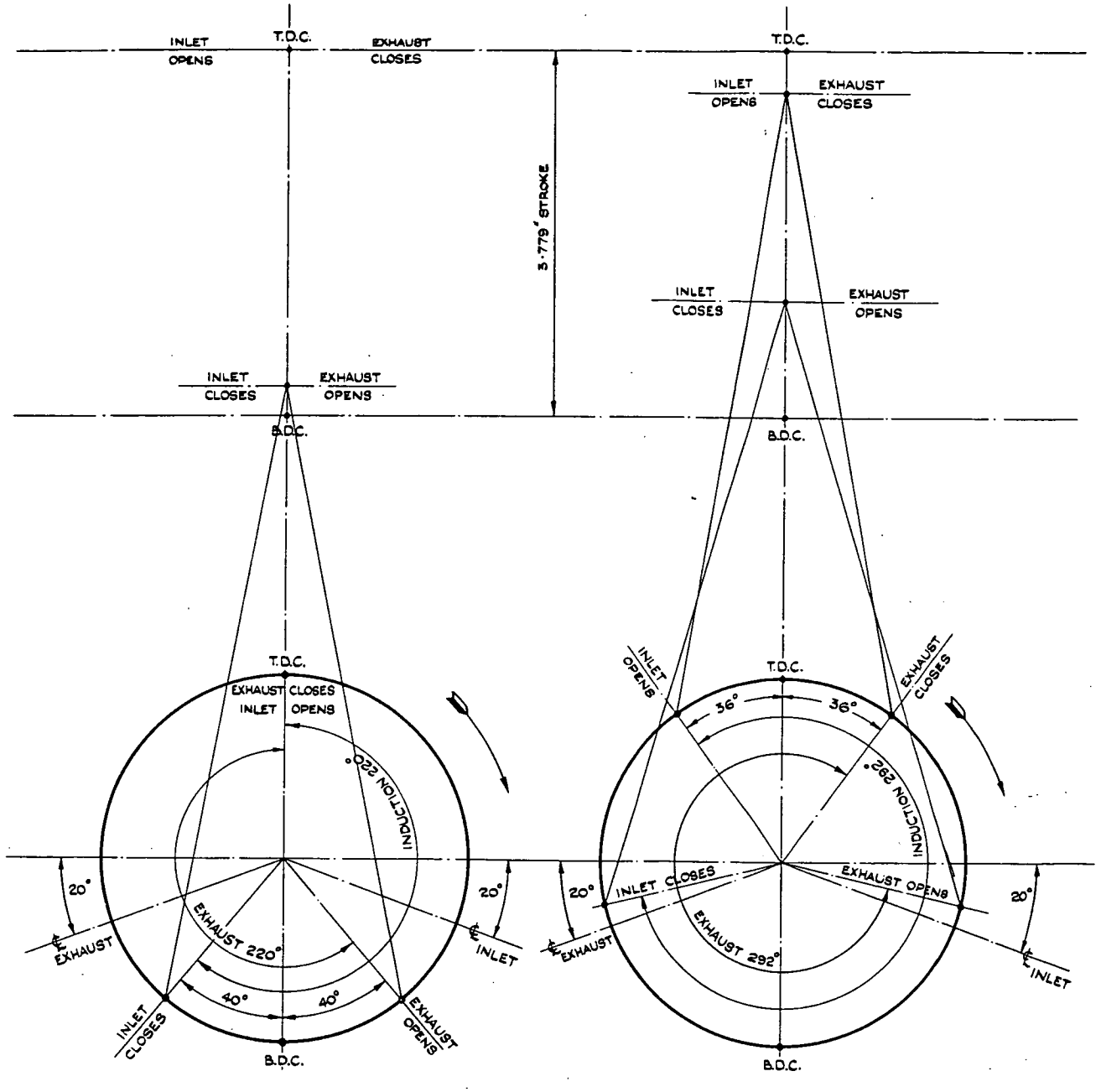


DIAGRAM I

FOR POSITIONING CAMSHAFT.
Nº1 CYL.ᴿ INLET & EXHAUST VALVE CLEARANCE SET TO ·044" (COLD)

DIAGRAM II

SHOWING VALVE TIMING UNDER RUNNING CONDITIONS WITH THE INLET & EXHAUST VALVE CLEARANCES SET TO ·012" (HOT)

VALVE TIMING DIAGRAMS
FOR CAMSHAFT N341800

Fig. 15. Valve timing diagram. N.341880 Camshaft.

No adjustment is provided here and should the end float be incorrect then the camshaft spigot faces or the retaining plate should be ground.

When correct remove the nut and chain wheel fit tabwashers to the retaining plate setscrews and tighten and lock.

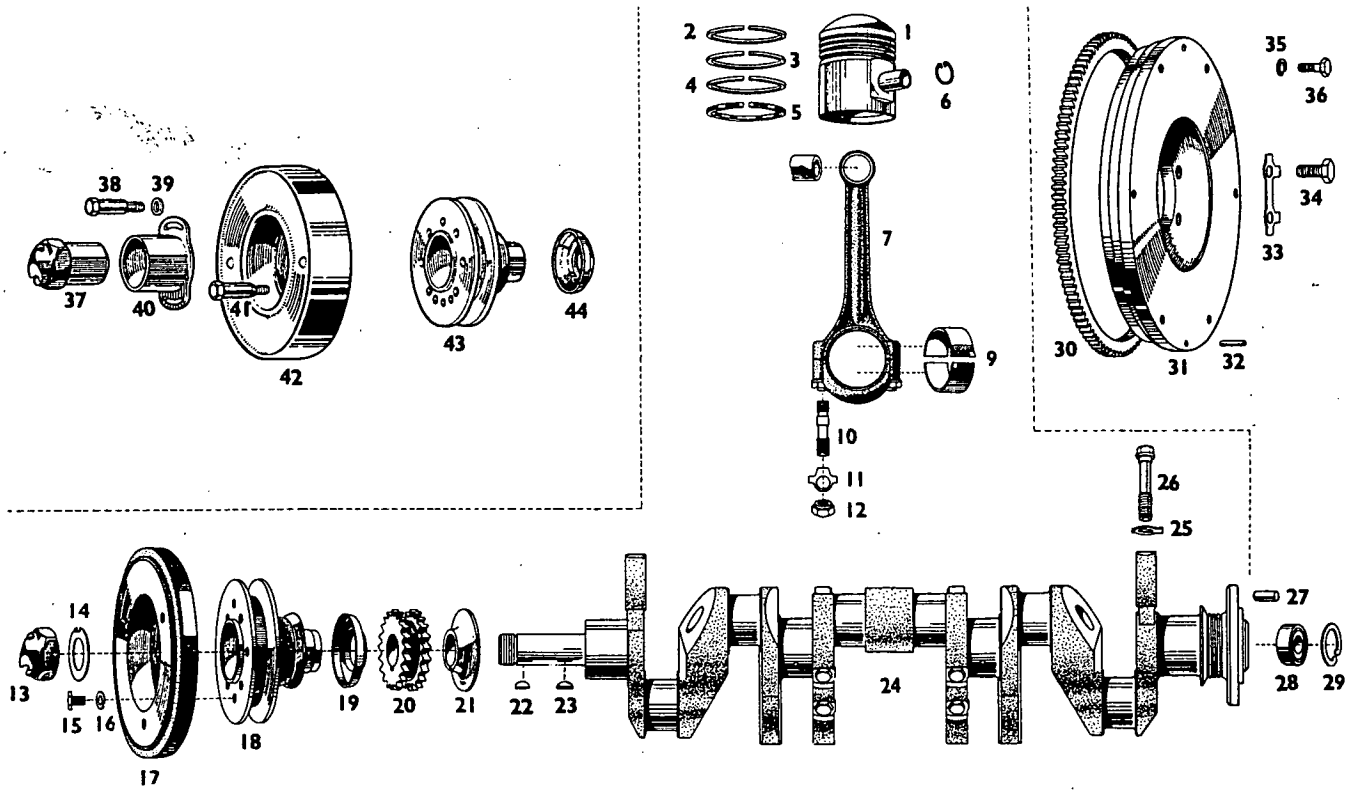
Fit the distributor and oil pump drive pinion and from the inside of the block fit the circlip. The end float of the pinion in the bush should be .0066 inch to .016 inch.

Re-assemble the front end and refit sump distributor drive, cylinder head etc.

Crankshaft Group

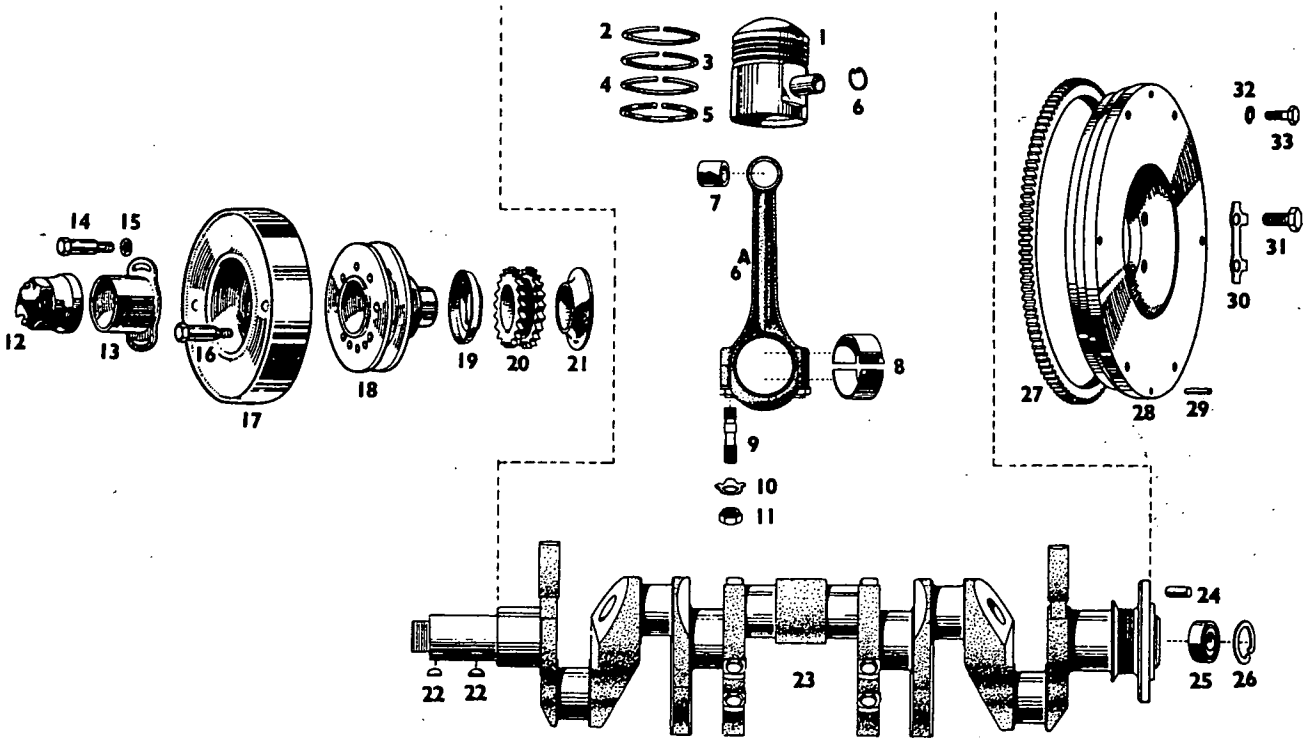
CRANKSHAFT GROUP. USE UP TO CHASSIS 4136

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.332030	1	Piston Unit - Std size (Gudgeon Pin selectively fitted)	6	N.330410	19	Oil Baffle (used on Chassis up to 4051).	1
N.331710	-	Piston Unit .010 oversize (Gudgeon Pin selectively fitted)	-	N.332630	20	Drive Sprocket	1
N.331200	2	Top Compression Ring - Std.	6	N.330450	21	Thrust Plate	1
N.331300	-	Top Compression Ring .010 oversize	-	N.332620	22	Key - 1/8" thickness	2
N.333200	3&4	Centre & Bottom Compression Ring - Std.	12	N.332600	23	Key - 5/32" thickness	-
N.333270	-	Centre & Bottom Compression Ring .010 oversize	-	N.331970	24	Crankshaft Unit (with 1/8" width keyway).	1
N.331220	5	Scraper Ring - Std.	6	N.332580	-	Crankshaft Unit (with 5/32" width keyway).	-
N.331310	-	Scraper Ring .010 oversize	-	N.331510	25	Tabwasher - Balance Weight	12
N.330100	6	Circlip - Gudgeon Pin	12	N.351500	26	Bolt - Balance Weight	12
N.331930	7	Connecting Rod Unit	6	FBS.379/J6	27	Dowel - Flywheel	1
N.330180	8	Gudgeon Pin Bush	6	N.330770	28	Ball Bearing	1
N.331090	-	Gudgeon Pin Bush + .020 o/d	-	N.330780	29	Circlip	1
N.330490	9	Connecting Rod Bearing - Std.	12	N.33160	30	Starter Ring	1
N.331110	-	Connecting Rod Bearing .010 undersize	-	N.331590	31	Flywheel Unit	1
N.331120	-	Connecting Rod Bearing .020 undersize	-	FBS.379/E8	32	Dowel	2
N.331240	10	Stud-Con Rod	12	N.331040	33	Locking Plate	3
N.330170	11	Tabwasher - Con Rod	12	N.332060	34	Flywheel Retaining Bolt	6
N.331410	12	Nut - Con Rod	12	AGS.585/E	35	Spring Washer	6
N.330260	13	Starter Dog)Used	1	N.332100	36	Clutch Retaining Setscrew	6
N.332010	14	Tabwasher - Starter Dog)on	1	N.333470	37	Starter Dog)	1
WS.105/4D	15	Engine Damper Retaining Screw)Chassis	8	N 333430	38	Securing Bolt Engine) Damper)	2
AGS.585/E	16	Spring Washer)up to	8	ND	39	5/16" Plain Washer) Used on	2
N.330200	17	Engine Damper Unit)4051	1	N.333450	40	Locking Plate complete) Chassis	1
N.330690	18	Engine Damper Carrier Unit. (with 1/8" width keyway).	1	N.333420	41	Securing Bolt - Engine) 4052 Damper) to	6
N.333320	-	Engine Damper Carrier Unit. (with 5/32" width keyway).	-	N.333460	42	Engine Damper) 4166	1
				N.333490	43	Damper Carrier)	1
				N.333500	44	Oil Baffle)	1



CRANKSHAFT GROUP. CHASSIS 4137 ONWARDS

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.332030	1	Piston Unit. Std. Size (Gudgeon Pin selectively fitted)	6	N.333450	13	Locking Plate complete	1
				N.333430	14	Securing Bolt - Engine Damper	2
N.331710	-	Piston Unit -010 oversize (Gudgeon Pin selectively fitted)	-	-	15	5/16" Plain Washer	2
				N.333420	16	Securing Bolt - Engine Damper	6
N.331200	2	Top Compression Ring - Std.	6	N.333460	17	Engine Damper	1
N.331300	-	Top Compression Ring .010 oversize	-	N.333540	18	Damper Carrier	1
N.333200	3&4	Centre & Bottom Compression Ring - Std.	12	N.333400	19	Oil Baffle	1
N.333270	-	Centre & Bottom Compression Ring .010 oversize	-	N.333370	20	Drive Sprocket	1
				N.333380	21	Crankshaft Thrust Plate	1
N.331220	5	Scraper Ring - Std.	6	N.332520	22	Key	2
N.331310	-	Scraper Ring .010 oversize	-	N.333520	23	Crankshaft Unit	1
N.330100	6	Circlip	12	FBS.379/J6	24	Dowel - Flywheel	1
N.333700	6A	Connecting Rod Unit	6	N.330770	25	Ball Bearing	1
N.333050	7	Gudgeon Pin Bush	6	N.330780	26	Circlip	1
N.333680	-	Gudgeon Pin Bush + .020 o/d	-	N.331990	27	Starter Ring	1
N.332330	8	Con. Rod Bearing - Std.	12	N.331590	28	Flywheel Sub-Unit	1
N.332950	-	Con. Rod Bearing .010 undersize	-	FBS.379/E8	29	Dowel	2
N.332960	-	Con. Rod Bearing .020 undersize	-	N 331040	30	Locking Plate	3
N.331240	9	Stud - Con. Rod	12	N.332060	31	Flywheel Retaining Bolt	6
N.332910	10	Tabwasher - Con. Rod	12	AGS.585/E	32	Spring Washer	6
N.331410	11	Nut - Con. Rod	12	N.332100	33	Clutch Retaining Setscrew	6
N.333690	12	Starter Dog	1				



Crankshaft Group

General Data

Main Bearings

Number.	4 (8 half-bearings).
Type.	Lead Indium Shell Type steel backed.
Torque loading of Main Bearing Cap Nuts.	28 to 30lb.ft. (4.167 to 4.464 Kg/m)
Main Bearing Journal diameters.	See Crankshaft re-grinding table.
Running clearance-Crankshaft to Main Bearings.	.002 to .0025 inch (.05 m/m to .06 m/m)
Mal-alignment limit.	.002 (.05 m/m)
Journal hardness	900 V.P.N.
Crankshaft Journal Width.	
Front.	1.466 - .002 inch (37.24 - .05 m/m)
Mid-Front & Mid Rear.	1.181 ± .010 inch (30.00 ± .025 m/m)
Rear.	1.418 ± .010 inch (36.02 ± .025 m/m)
Radius on front spigot, Main and Crankpin Journals.	
Crankshaft N.331970 N.332580	.060 Rad. (1.52 m.m)
Crankshaft N.333520 On front spigot and Front Main Journal.	.060 Rad. (1.52 m/m)
All other Main and Crankpin Journal.	.100 Rad. (2.54 m/m)
Thrust taken on.	Thrust Plate on Front Journal.
End Float of Crankshaft.	
New.	.002 to .008 inch (.05 to .20 m/m)
Worn.	.004 to .012 inch (.010 to .030 m/m)
Top and Bottom Thrust Plate Thickness.	See Crankshaft re-grinding table.
Crankpin Diameter.	See Crankshaft re-grinding table.
Torque loading of Crankshaft Balance Weight Bolts.	36 lb.ft. (5.367 Kg/m)

Connecting Rod and Pistons

Connecting Rod

Material.	Steel Forging.
Distance between centres.	6.4567 ± .002 inch (164.01 ± .05 m/m)
Small end of Rod.	
Gudgeon Pin Bush Location.	.830 + .0005 (21.08 m/m + .01 m/m)
Gudgeon Pin Bushes.	
Material.	Phosphor Bronze.
Inteference fit - Bush to Con Rod.	.001 to .002 inch (.03 to .05 m/m)
Bush Bore finished diameter.	.7097 to .0004 inch (18.026 + .010 m/m)
Gudgeon Pin to Bush clearance.	.0006 to .001 inch (.02 to .03 m/m)
Con Rod Big End Bearings.	
Type.	Lead Indium Shell Type steel backed.
Running clearance on Journals.	.0012 to .0022 inch (.03 to .05 m/m)
End Float of Con Rod on Crankshaft	.008 to .0116 inch (.020 to 2.95 m/m)
Torque loading of Con Rod Cap Nuts.	30 to 32 lb.ft. (4.46 to 4.76 Kg/M)

Pistons

Material	Aluminium Alloy. Press Forged.
Clearance in Cyl. Bore checked cold on thrust side	.0022 to .0026

at bottom of skirt.	(.056 to .066 m/m)
Number of Piston Rings to each Piston.	4
Gap when fitted to cylinder bore.	.010 to .015 inch (.25 to .38 m/m)

Replacement Crankshafts

Replacement fully balanced, reground and nitride hardened crankshafts are available from the works. They are supplied subject to the return and inspection of the removed crankshaft which will only be accepted in exchange of normally worn and not below the minimum sizes quoted in the Crankshaft regrinding table.

Inspection of Crankshaft in situ

Consistent low oil pressure, after normal adjustment of the relief valve, is usually the sign of excessive clearance between the crankshaft and the bearings.

The crankshaft cannot be removed with the engine in the car as the front bearing cannot be removed. Inspection of the three remaining bearings and the connecting rod bearings will indicate that wear and this can be carried out as follows.

Remove the sump. See procedure in this section.

Remove the two centre and the rear main bearing caps. Inspect the crankshaft for ridging and with care it can be measured for size with a vernier or micrometer and compared with the sizes given in the crankshaft regrinding table and the running clearance given in the General Data of this Section.

If favourable remove the caps and check the connecting rod bearings and journals and if these are also favourable for appearance and size then fit new bearings shells of the appropriate size to the connecting rods and the three only main bearings.

The existing half bearings will slide out from round the journals and new ones can be inserted likewise.

Replace the bearings caps, tighten to the correct torque loading figure and lock with the tabwashers.

Carried out carefully this procedure can be effective in correcting the oil pressure and save considerable time.

Removing Crankshaft from the Engine

For procedures and methods of removing assemblies and parts refer to the index.

Remove the gearbox and then the engine.

Remove the cylinder head as in Decarbonizing.

Remove the dynamo then detach the push rod cover and remove the tappets and vertical push rods.

Detach the oil filter.

If a suitable mounting stand is not available to facilitate stripping, arrange wood blocks and turn the engine so that it rests on the cylinder block face.

(1) Remove the clutch assembly followed by the flywheel.

(2) Remove the sump.

(3) Remove the oil pump and oil pump drive shaft.

Dismantle the front of the crankshaft using the following procedures.

Rubber bonded type damper. (Type 404 and early Type 405 Cars).

Release the tabwasher and remove the starter dog. R.H. thread. Then remove the complete damper and carrier complete by pulling off by hand or by careful tapping. This assembly is balanced and should not be separated unless damaged.

Viscous Type damper (later Type 405 Cars).

Break the locking wire and unscrew the eight bolts retaining the damper to the carrier. Take away the starter dog locking plate and guide tube. Carefully remove the heavy viscous damper from its spigot on the carrier. Unscrew the starter dog. R.H. thread.

Using an extractor TFN.5083 withdraw the damper carrier from the spigot of the crankshaft.

Then proceed as follows:

Remove the camshaft drive cover.

Release the tabwasher and remove the nut securing the camshaft chain wheel.

Take off the oil baffle and withdraw the chain wheel and drive sprocket complete with the chain. The chain wheel and drive sprocket are both a push fit and they should pull or prise off their respective shafts.

Take off the thrust plate and the upper and lower thrust plates from the front main bearing. Label these plates 'front' if they are not being renewed.

Remove the oil pump.

Release all tabwashers then remove the main bearing and connecting rod caps. All caps are stamped for positioning.

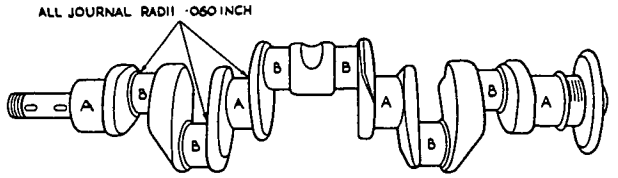
Lift the crankshaft from the block. Take the lower and upper thrust plates from the rear of the front bearing and label them 'rear' if they are not being renewed.

Inspection of Crankshaft

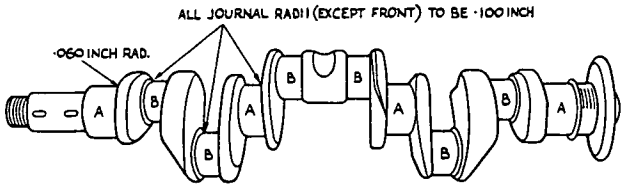
Referring to the crankshaft regrinding table check the journals for size. It will be noted that the smallest diameter undersize of the connecting rod journals is .020 inch below new and the smallest undersize of the main journals is .040 inch below new. Shell bearings are available in various stages down to these sizes and the largest possible diameter should be considered to retain the 'life' of the crankshaft.

If the crankshaft is cracked, worn, grooved or scored

below the minimum sizes given then it is scrap. No schemes, such as the chrome plating of the diameters is recommended.



CRANKSHAFT N.332580



CRANKSHAFT N.333520

MAIN DIAMETERS. A.	HALF BEARING PART Nº		
	FRONT	CENTRE	REAR
2.1245 – 0·0005 INCH (STANDARD)	N.313130	N.313940	N.313930
2.1145 – 0·0005 INCH (·010 U/SIZE)	N.313220	N.314320	N.314300
2.1045 – 0·0005 INCH (·020 U/SIZE)	N.313230	N.314330	N.314310
2.0945 – 0·0005 INCH (·030 U/SIZE)	N.314470	N.314510	N.314490
2.0845 – 0·0005 INCH (·040 U/SIZE)	N.314480	N.314520	N.314500

CONNECTING ROD DIAMETERS. B.	HALF BEARING PART Nº	
	FOR CRANKSHAFT N.332580	FOR CRANKSHAFT N.333520
1.771 – 0·0005 INCH (STANDARD)	N.330490	N.332330
1.761 – 0·0005 INCH (·010 U/SIZE)	N.331110	N.332950
1.751 – 0·0005 INCH (·020 U/SIZE)	N.331120	N.332960

THRUST PLATES	PART Nº	
	TOP	BOTTOM
0·093 – 0·002 INCH (STANDARD)	N.313590	N.313600
0·0955 – 0·002 INCH (+·0025 OVERSIZE)	N.313770	N.313780
0·098 – 0·002 INCH (+·005 OVERSIZE)	N.313790	N.313800

Crankshaft re-grinding table

If the crankshaft is satisfactory for size an exchange replacement can be obtained from the works or where this is not practicable it can be reconditioned.

Check thoroughly for cracks with magnaflux if available but otherwise visually.

Mount the shaft on 'V' blocks at the front and rear main bearing journals and check for alignment.

Remove the circlip from the recess in the rear of the crankshaft and using a standard puller remove the ball bearing. Check the ball race for wear.

Regrinding the Journals

Crankshafts are nitrogen hardened and they should be nitrogen hardened after each regrind therefore facilities should be available for this process.

The balance weights which are already stamped for correct positioning should be removed.

It is the practice at the works to grind all diameters to a pre-determined size depending on the condition of the journals i.e. all main journals to say .010 inch undersize and all connecting rod journals to say .020 inch undersize. This practice however is not essential and the crankshaft could be ground as required providing that the correct bearings are ordered.

During the regrinding operation care should be taken to retain the correct radii as given in the General Data and Crankshaft regrinding table.

Recheck for cracks after the grinding operation.

Nitriding

Prepare the shaft for nitriding by washing the shaft clean of all grease and protect the starter dog threads by an anti-nitriding agent or by covering the thread with a blanking cap.

Nitride the shaft for 12 hours at 495° C (922° F).

Lighly polish the 'bloom' from all journals. Recheck the alignment and re-check for cracks.

Finally ensure absolute cleanliness of all oil ducts.

Refit a ball race to the recess and secure with the circlip.

Refitting the Crankshaft to the Engine

With the cylinder block resting on its top face fit the correct main half bearings into position and also the top thrust plate, bronze face to crankshaft, to the rear of the front bearing.

It is important to note that all bearings are supplied carefully packed to avoid scratching or damage to the inner bearing faces. Apart from washing off the protective lanolin they are supplied ready for use and no attempt should be made to scrape them.

Lubricate the bearing surfaces and fit the crankshaft into position.

Fit a bottom thrust plate, bronze face to crankshaft, to the rear of the front bearing cap, fit half bearings to all the caps and fit the caps into the correct position as stamped.

Fit tabwashers and nuts, and temporary tighten in order to check the end float.

Fit the top and bottom thrust plates, bronze face outward, to the front of the front bearing and position the crankshaft thrust plate.

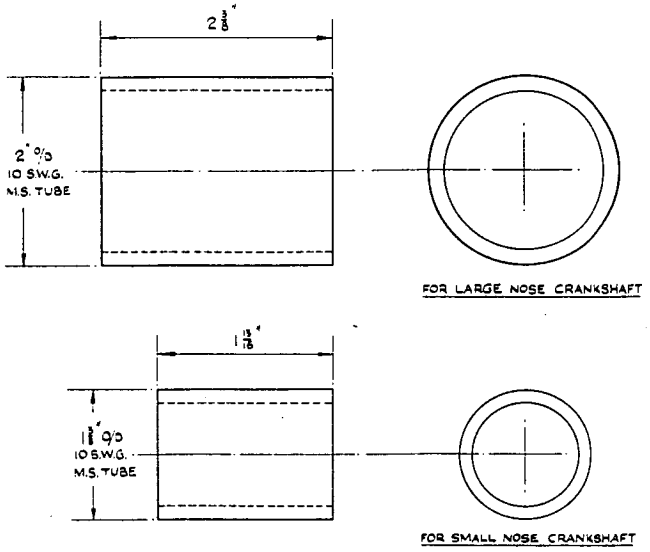
Using a temporary sleeve Fig.16 to take the place of the engine damper carrier, fit the starter dog and tighten.

With a dial indicator check the end float of the crankshaft as shown in Fig.17 using the figures given in General Data. If incorrect select and fit thrust plates from the sizes given in the crankshaft regrinding table. When satisfactory remove the starter dog and the temporary sleeve.

Tighten the bearing cap nuts to the torque loading

figure given and lock the nuts.

Remove the crankshaft thrust plate from the front of the crankshaft taking care that the thrust plates do not drop out of position.



TEMPORARY SLEEVES FOR CHECKING CRANKSHAFT END FLOAT

Fig. 16. Temporary sleeves for checking crankshaft end float

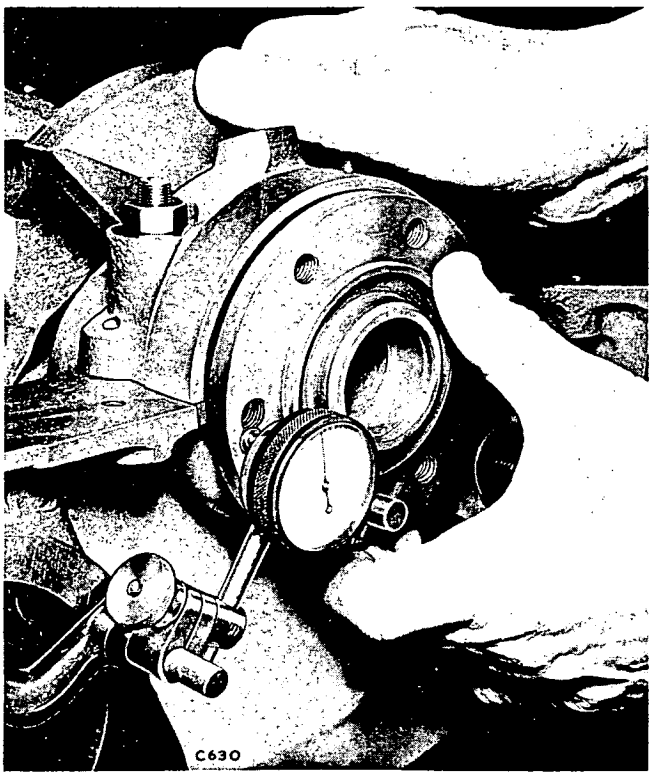


Fig. 17. Crankshaft end float

Fit the rear key and fit the crankshaft thrust plate back into position.

Read the directions for fitting the damper carrier to see if the crankshaft requires marking before proceeding further.

Refit the key to the camshaft if it has been removed.

Fit the drive sprocket and chain wheel inside the chain so that the timing marks on each coincide, see Fig.18 and fit this assembly to the crankshaft and camshaft holding the camshaft forward as shown in Fig.19 and also prevent the crankshaft from moving backwards and so releasing the thrust plates from the rear of the front bearing.

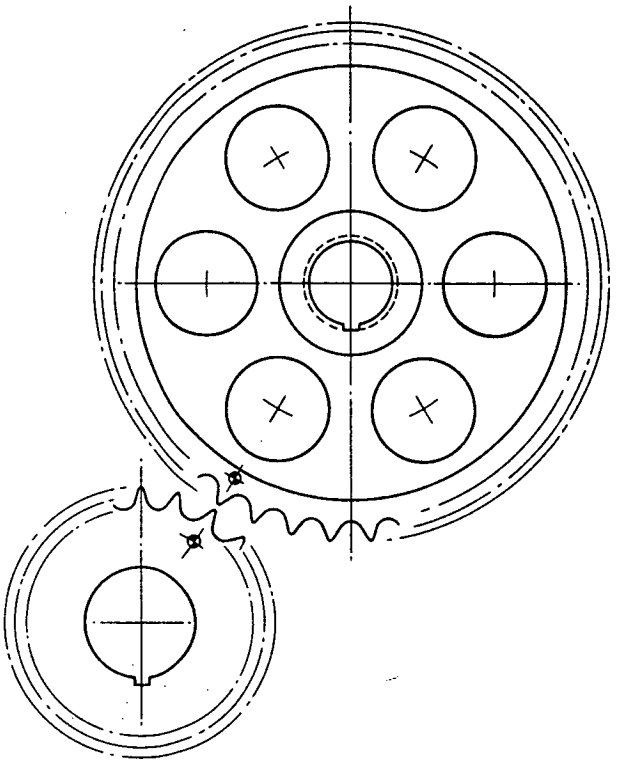


Fig. 18. Timing marks on chain wheels

Fit the oil baffle dished face outwards and fit the front key to the crankshaft.

Thoroughly oil a new felt washer and fit it into the recess of the camshaft drive cover. Fit a joint washer to the camshaft drive cover using a jointing compound on both faces.

Fit the damper carrier unit into the felt washer and offer up this assembly to the engine.

On crankshafts with a small front spigot (1.065 dia.) it is possible to locate the keyway on to the key and then drive the damper carrier on to the shaft. On the later crankshaft with the larger front spigot (1.699 dia.) this is not possible, as the carrier is an interference fit and the key is back from the front edge of the spigot. It is therefore necessary to either (a) carefully mark the position of the keyways before the drive sprocket is fitted by laying a straight edge along the keys on both

sides and marking the front edge of the spigot (b) use special tool TFN.5082 for aligning the keyways.

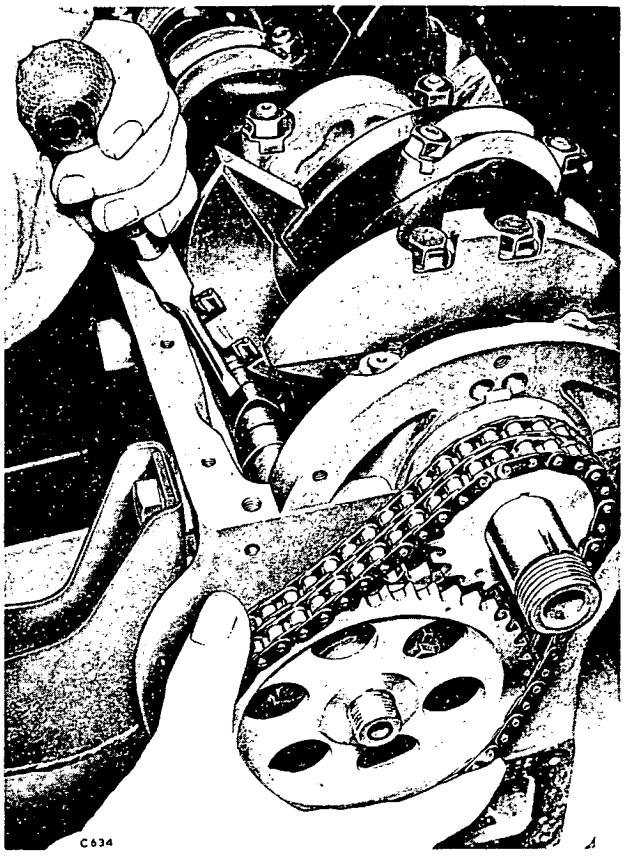


Fig. 19. Holding camshaft forward

When the keyways are carefully aligned drive the damper carrier into position using an aluminium drift similar to TFN.5080. It is essential that the crankshaft is prevented from moving backwards during this operation and thus allowing the front thrust plates to drop out of their locations.

On earlier engines with the rubber bonded crankshaft damper the carrier and damper is bolted together and balanced before offering to the crankshaft. When this assembly has been positioned on the crankshaft fit a new tabwasher and screw and tighten the starter dog, finally locking the tabwasher.

Proceeding with the assembly of the viscous type damper, fit the starter dog and finally tighten.

Locate the viscous engine damper on to its spigot on the carrier and insert and tighten progressively the six taper bolts.

Fit the guide tube and locking plate into a locking position on the hexagon of the starter dog, fit two 5/16" plain washers on the remaining two flat faced bolts and finally screw them into position.

Wire lock the eight damper securing bolts using the holes provided for this purpose.

Refit the oil pump, sump, flywheel and clutch, turn the engine on to the sump face and complete the assembly of the tappets, vertical push rod, cylinder head etc.

Pistons and Connecting Rods

Removing a Piston or Pistons with the Engine in the car.

Remove the cylinder head.

Remove the sump.

Remove the cap of one connecting rod only.

Revolving the crankshaft as necessary, push this connecting rod upwards until the piston gudgeon pin is clear of the bore.

Remove the gudgeon pin circlips and with the connecting rod supported, to prevent it dropping, lightly tap out the gudgeon pin. This gudgeon pin is a selective fit to the piston and should remain with it. Withdraw the connecting rod from below.

Repeat this process on each piston and rod in turn. If pistons and rings are to be refitted keep them in their correct positions.

To refit a new Piston or Pistons to the cylinder block as above i.e. to a used block in situ.

All new pistons supplied by the manufacturers have a gudgeon pin selectively fitted.

Gap the rings in the bore. Insert the connecting rod and support with the small end protruding through the top of the bore and the numbering on the rod. (Fig.20.) facing the camshaft.

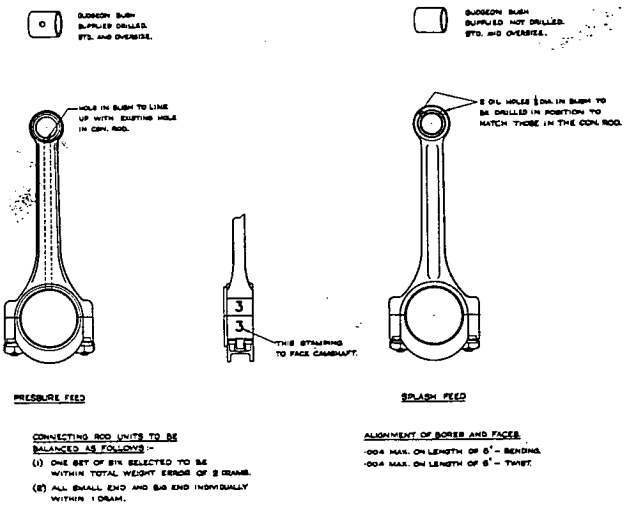


Fig. 20. Con. rod identification and numbering

Warm the piston with its gudgeon pin in boiling water and push back the gudgeon pin to allow the small end to enter. Fit a circlip to the piston, locate the piston over the connecting rod and push in the gudgeon pin. Fit the other circlip to its groove to retain the gudgeon pin.

Fit the piston rings and insert the piston. With the shell bearings in position oil and assemble the big end to its crankpin and lock the tabwashers.

Note. It is vitally important that the connecting rods are fitted the correct way round owing to the offset of the small ends.

This is noted in manufacture by facing the stamping on the connecting rod Fig.20 to the camshaft but it is always worth a careful check.

To fit new Pistons to a block with the engine dismantled.

If used pistons are being fitted to a new or re-sleeved block or, vice versa, if new pistons are being fitted to a used block, first check the piston clearance. This should be not more than the figures given in general data and clearance above the .0026 inch maximum will result in piston slap.

Check the gaps of the rings in the bores and of necessary gap to the figures given.

Heat the pistons with gudgeons pins in boiling water and push the pin clear of the connecting rod location but not out of the piston. Fit a circlip and locate the piston over its connecting rod and while still warn push the gudgeon pin through the small end through to the circlip. Fit the other circlip.

Fit the pistons rings and the assembly is then ready for inserting into the underside of the block.

Connecting Rods Fig.20.

Connecting rods are built into each engine as a balanced set of six and are stamped 1 to 6. Should a single connecting rod or less than a set be required they will be supplied but they must be balanced with the existing rods.

Engines up to Chassis 4136 were fitted with pressure oil feed to the small end via a hole drilled through the centre of the rod. From Chassis 4137 onwards the small end is lubricated by splash feed i.e. no central hole.

It is important then that pressure or splash feed rods are specified should less than a set be required for replacement otherwise balancing will not be practicable.

Gudgeon Pin (small end) Bushes

Standard size outside diameter bushes and .020 inch oversize outside diameter bushes are available as spares. Standard size bushes are usually suitable for replacement but should the bore be over .830 it would be advisable to grind the .020 bush to obtain the interference fit given in General Data.

Press or drift out the old bush but it is recommended that the new bush is positioned by freezing. This ensures squareness with the rod and is easier to align the hole in the bush with the lubrication hole in the centre of the rod. If the bush is pressed in without freezing care must be taken to see that the holes are aligned as there are no facilities for drilling once the bush is positioned.

On splash feed rods this point is not important as the two oil holes have to be drilled after the bush is inserted.

The bore of the bush should be sized to the figure given in General Data and this operation should be carefully carried out in a machine or standard alignment fixture. Never hand ream which would result in misalignement.

Finally scrape the sharp edges from the oil holes.

Big End Bearing

See the Crankshaft regrinding table. These bearings are supplied standard and undersize in the bores only. The outside diameter is constant so that a connecting rod that has become mis-aligned cannot be corrected by the slightest enlargement of the big end bore.

Piston Sizes

Standard and .010 inch oversizepistons are available. The oversize piston is only recommended where a score or bad bores may have occurred at any time early in the life of the engine.

At engine overhaul when pistons are being replaced it is recommended that resleeving back to standard size takes place and at the same time inspection of the camshaft bushes for wear and cleanliness of the oilways.

Flywheel and Starter Ring

Service replacement Flywheels complete with starter ring are not available from the manufacturer. In the event of a starter ring needing replacement a new ring should be fitted to the existing flywheel.

Flywheel Starter Ring

The starter ring is shrunk on to a machined location on the forward side of the flywheel rim. Assuming that the flywheel has been removed the old ring can progressively be removed with a suitable drift and hammer. After removal examine the ring location and if necessary dress off any scores or burrs.

To fit a new ring proceed as follows:

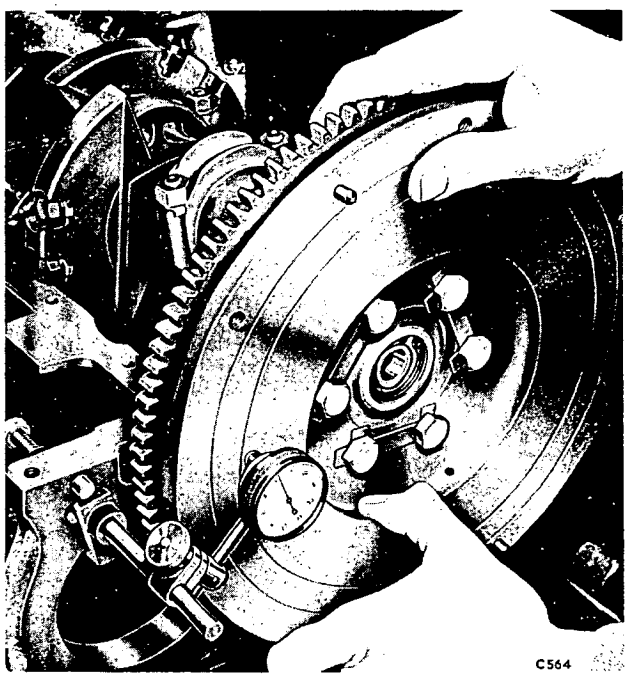


Fig. 21. Flywheel run out

Heat the new ring in oil at 160° C (320°F) for at least 10 minutes.

With the flywheel lying flat on the clutch plate contact face, place the ring on to its location and progressively press it or tap it into position. Carry out this operation as quickly as possible to ensure that the ring does not tighten on the flywheel before it is in its correct position.

As the ring is uniform throughout it is not necessary to re-balance the flywheel unit.

Flywheel

The material is cast iron. Should the clutch contact face be scored or heat cracked it should be ground, removing only the minimum amount necessary.

The nominal thickness of the flywheel is 1.125 inch (28.58 m/m) and this should not be reduced to less than 1.075 (27.3 m/m).

If grinding is carried out with care a number of facing operations can take place before the minimum dimension is reached and the flywheel scrapped.

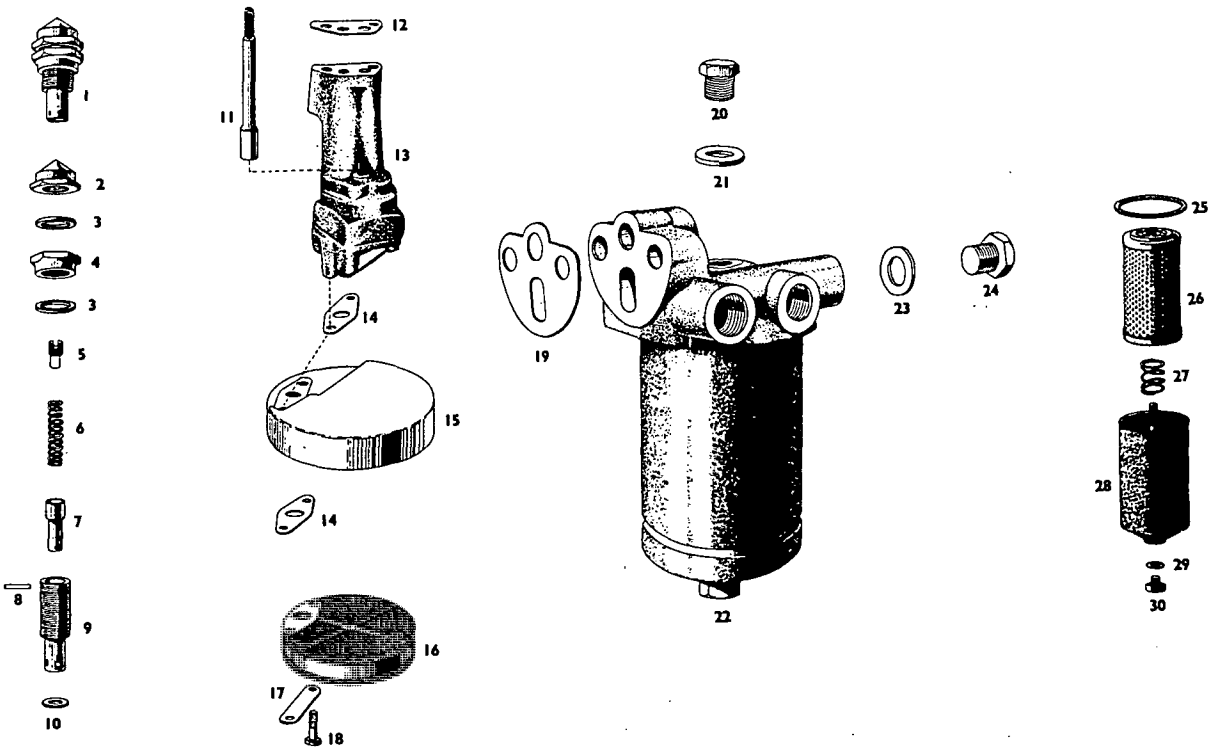
Checking Flywheel 'run out'

In all instances when a flywheel is fitted it is advisable to check the face for truth. Locate the flywheel on its dowel pin fit the locking plates and screws and tighten. Check the face for run-out as shown in Fig.21 which should not exceed .002 inch (.05 m/m). If satisfactory lock the bolts.

Oil Pump, Relief Valve and Oil Filter

OIL PUMP AND OIL FILTER

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.361460	1	Oil Relief Valve Unit	1	N.360460	16	Oil Filter Sieve Unit	1
N 360030	2	Relief Valve Cap	1	N.360220	17	Oil Filter Sieve Locking Plate	1
N.360050	3	Relief Valve Washer	2	N.360830	18	Oil Filter Sieve Cover Bolt	2
N.360020	4	Relief Valve Locknut	1	N.360740	19	Gasket	1
N.360060	5	Relief Valve Adjusting Screw	1	N.361050	20	Sleeve Nut	1
N.361450	6	Relief Valve Spring	1	N.360710	21	Washer	1
N.360070	7	Relief Valve	1	N.361000	22	Oil Cleaner Assy.	1
N.360080	8	Relief Valve Retaining Pin	1	N.360870	23	Washer - Cleaner Head	3
N.361310	9	Relief Valve Body	1	FBS.53	24	Plug - Cleaner Head	3
N.361030	10	Washer - Oil Relief Valve Joint	1	N.360690	25	Joint Ring	1
N.361830	11	Oil Pump Drive Shaft Unit	1	N.360650	26	Insert Assembly	1
N.361440	12	Oil Pump Casing Joint	1	N.361060	27	Spring	1
N.361430	13	Oil Pump Assembly	1	N.360640	28	Case Assembly	1
N.361530	14	Oil Filter Sieve Cover Joint	2	N.360700	29	Washer	1
N.361520	15	Oil Filter Sieve Cover	1	N.360670	30	Drain Plug	1



Oil Pump, Relief Valve and Oil Filter

Lubrication System

The Engine Lubrication System is shown diagrammically in Figs.22 and 23

Engine Oil

It is most important to use the recommended grade of oil according to the season and climate conditions.

Maintain the level of the oil at the correct level as shown on the dipstick. Avoid overfilling as this will result in high oil temperature and consumption.

Adjusting Oil Pressure

The oil pressure should be 60 p.s.i. (4.22 Kg/cm) at 70° C and if the pressure is incorrect and cannot be traced to other causes proceed as follows.

Run the engine until the oil temperature is 70° C then open up to 3,000 rpm.

Remove the relief valve cap, sealing washer and retaining pin, then screw OUT the adjusting screw to decrease the pressure, or screw IN to increase the pressure, see Fig.24

When the pressure is correct, refit the retaining pin, fit the sealing washer and then screw on and tighten the cap securely.

Removing and Refitting Relief Valve

If the operation of the relief valve is suspect remove the complete assembly and inspect it. The relief valve components are shown in the spares illustration of this section.

To remove slacken and screw off the cap and remove the fibre washer, screw the cap back on, not tight, and slacken the locknut attaching the relief valve to the block.

Using two spanners tighten the locknut to the cap and then screw out the complete assembly from the cylinder block.

Discard the aluminium seating washer fitted in the cylinder block recess.

Holding the locknut loosen the cap then remove the cap, locknut and fibre washer.

Extract the adjuster retaining pin, unscrew the adjusting screw and withdraw the valve and spring.

Clean all the parts thoroughly. Check that the outlet ports in the body are not obstructed and inspect the valve for scoring or high spots, if necessary dress such areas by light stoning.

Never lap the valve to the body. Trial fit the valve in the body where it should be an easy sliding fit. When this is satisfactory re-assembly as follows.

Fit the valve, spring and adjuster to the relief valve body screwing in the adjusting screw until the retaining pin can be inserted.

Fit a new aluminium seating washer into the recess in the cylinder block.

Fit the locknut and cap, without a fibre washer between, to the body, lock them together and screw the valve body into the cylinder block. Make sure that the valve body is screwed down firmly to its seating washer or loss of oil pressure may result.

Separate and remove the locknut and cap. Fit the fibre sealing washer over the body and lock the assembly into position with the locknut.

Before fitting the cap set the oil pressure as described previously and finally fit the fibre washer and screw on and tighten the cap.

Oil Filter

The 'Vokes' full flow type oil filter houses a replacement element known as the 'insert assembly'. A seating washer is attached to the upper end cap of the insert assembly, a spring located beneath the assembly holding this against a seating on the head thus providing a by-pass in the event of the assembly becoming sludged.

To service, slacken the sleeve nut at the top of the filter head, hold the casing while the nut is unscrewed then remove the casing. Drain the oil then withdraw the insert assembly and spring. Do not attempt to clean the insert assembly which should be renewed every 5,000 miles.

Make sure that the casing is clean check the condition of the spring and the joint washer for the sleeve nut. Fit the spring to the casing and then the insert assembly. Examine the rubber joint washer in the filter head and replace if necessary. Fill the casing, with the insert, with clean approved engine oil to ensure an immediate supply to the engine, fit the casing to the head and secure firmly with the sleeve nut and its joint washer.

To remove the complete filter from the block release the two bolts and washers.

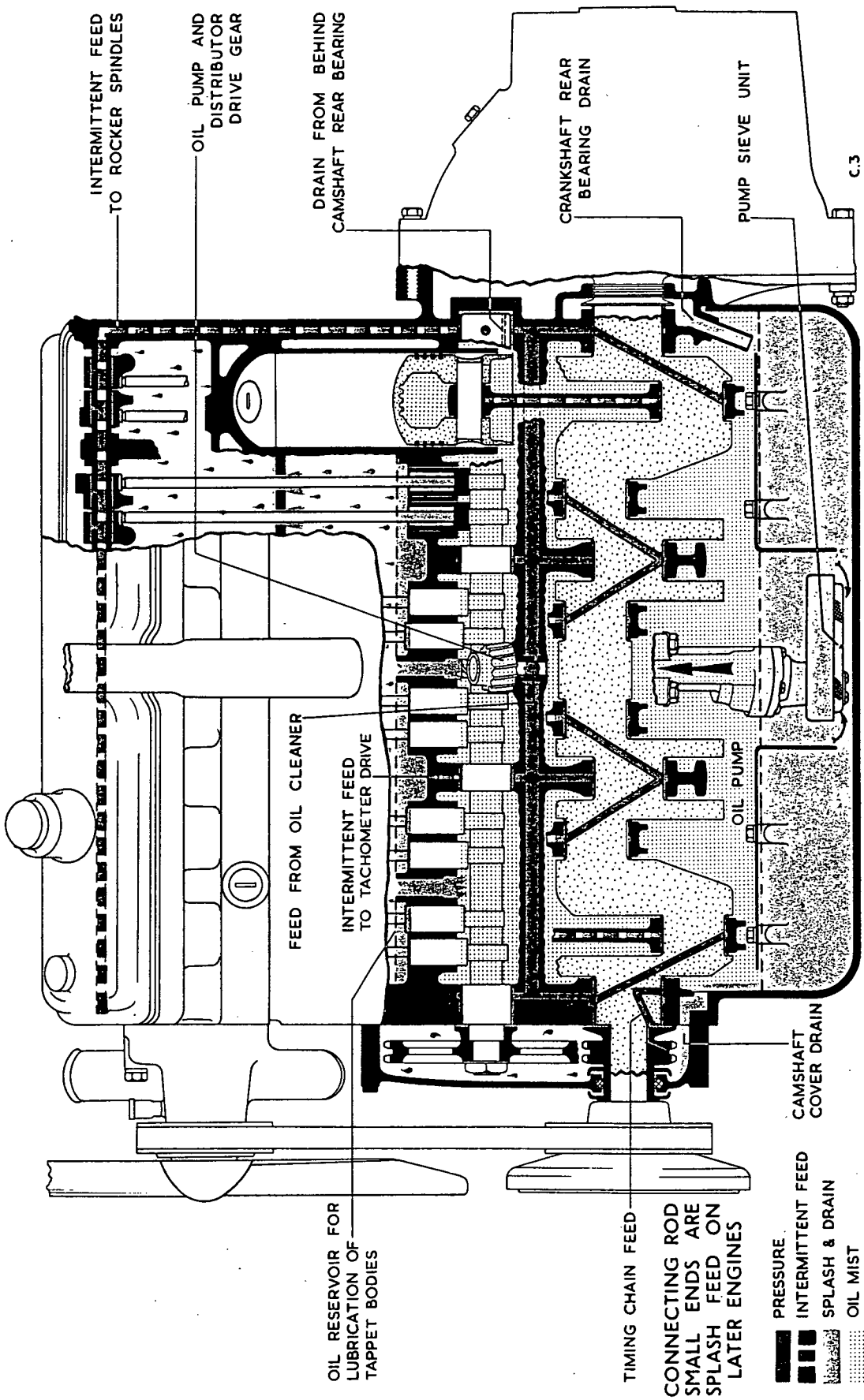


Fig. 22. Engine lubrication diagram Sheet 1

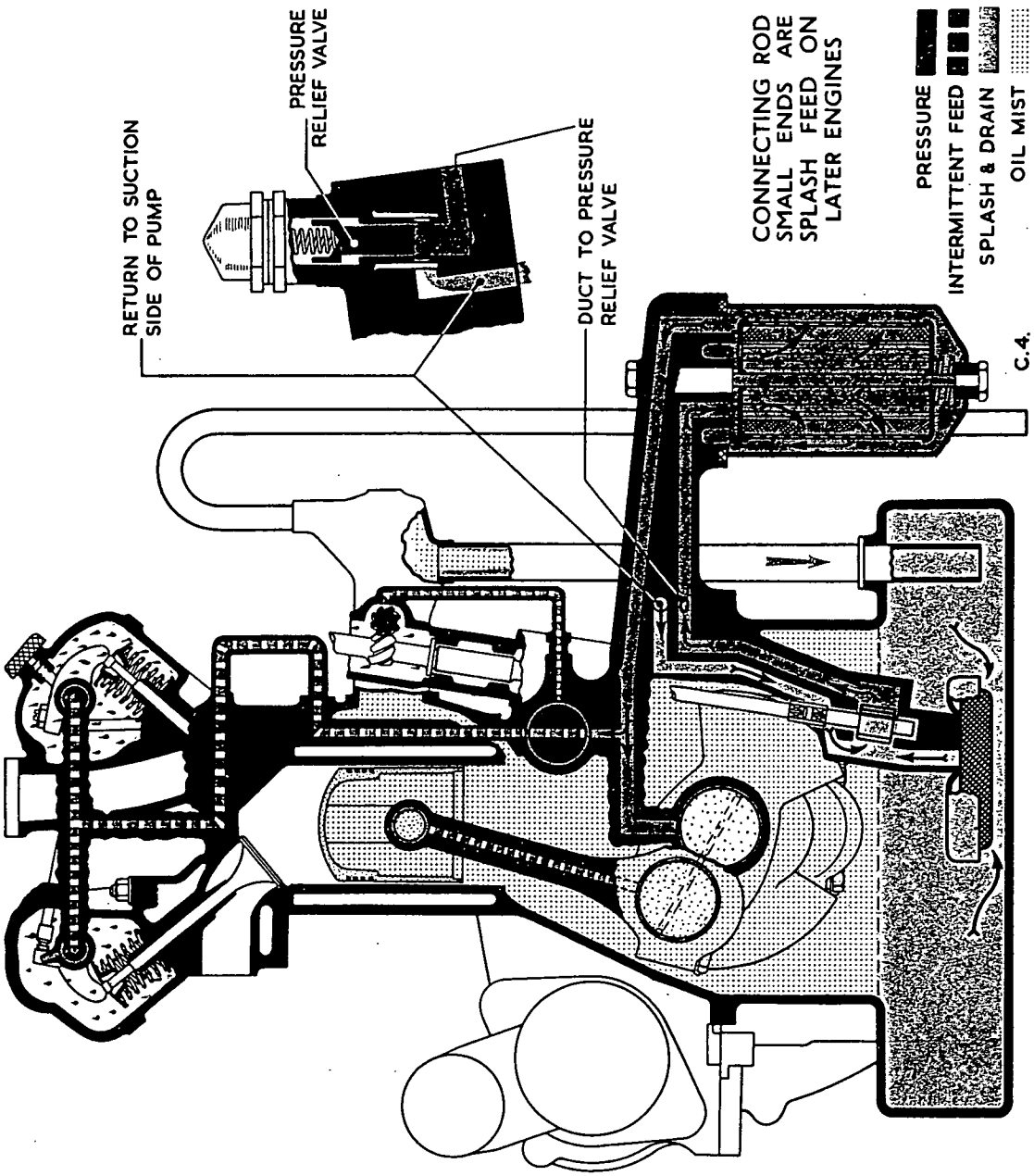


Fig. 23. Engine lubrication diagram Sheet 2

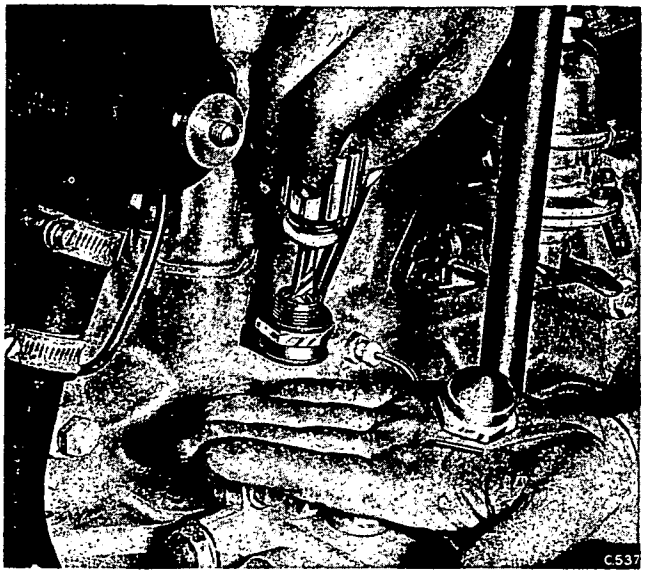


Fig. 24. Oil pressure relief valve

To refit, make sure that the joint faces are clean, use a new joint washer, but do not use jointing compound. Make sure that the joint washer is fitted correctly as shown in Fig.25 fit the bolts and spring washer and tighten.

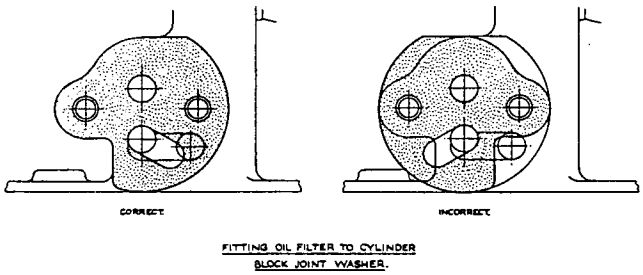


Fig. 25. Oil filter joint washer - correct fitting

It is a common fault to fit the joint washer incorrectly by offering it to the filter and not to the block.

Oil Pump

Replacement serviced oil pumps are not available, neither are detail parts available as spares. In the event of general wear which could be causing loss of oil pressure a new oil pump should be fitted.

Removing the Pump

Drain and remove the sump.

Release the tabwashers, unscrew the two nuts and withdraw the pump from the two studs together with its driving shaft.

Dismantling

Release the tabs of the locking plate, remove the two bolts securing the sieve unit then remove the locking plate, sieve and sieve cover.

Cut the locking wire, remove the bolts securing the pump cover, then remove the cover and withdraw the inner and outer rotors.

Clean and dry the components paying particular attention to the oilways and sieve.

Examine all parts of the pump assembly. To check the rotors for wear fit them back into the pump body then check the clearance between the inner and outer rotors as shown in Fig.26 This clearance should be .0045 to .0065 inch (.117 to .168 m/m) and if in excess of this a new pump should be considered.

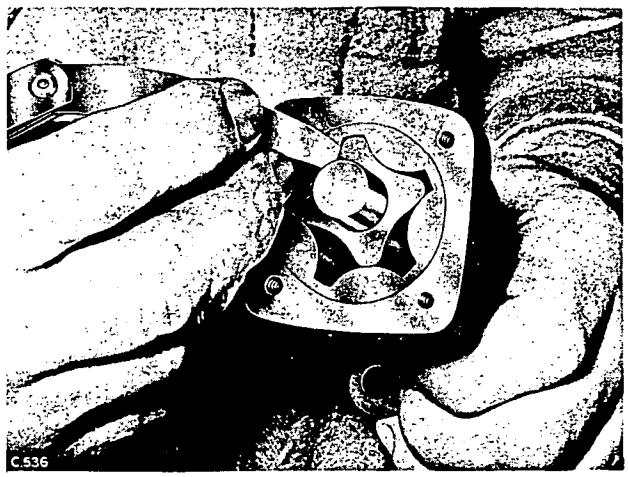


Fig. 26. Oil pump rotor clearance

Fig. 27. Oil pump end float

Check the end float of the rotors to the casing as shown in Fig.27 and this should be .0005 to .0015 inch (.01 to .038 m/m). Check that the pump body and cover are seating correctly and lap if necessary to obtain a good face.

Assembling

Make sure that all parts are scrupulously clean, then lubricate the outer rotor and assemble it to the pump body, chamfered edge inwards.

Lubricate the inner rotor and fit it to the outer rotor, with the squared end of the spindle projecting through the body.

Fit the pump cover and secure with its bolts and plain washers. No joint washer or jointing compound is used on the joint face. Test the pump for freedom of rotation. If the pump is tight, and the end float is correct, release the bolts, re-position the cover slightly on the bolts, then re-tighten and retest.

When this is satisfactory, wire-lock the bolts.

Finally re-assemble the joint washer, sieve cover, another joint washer, sieve and locking plate and secure with the two bolts.

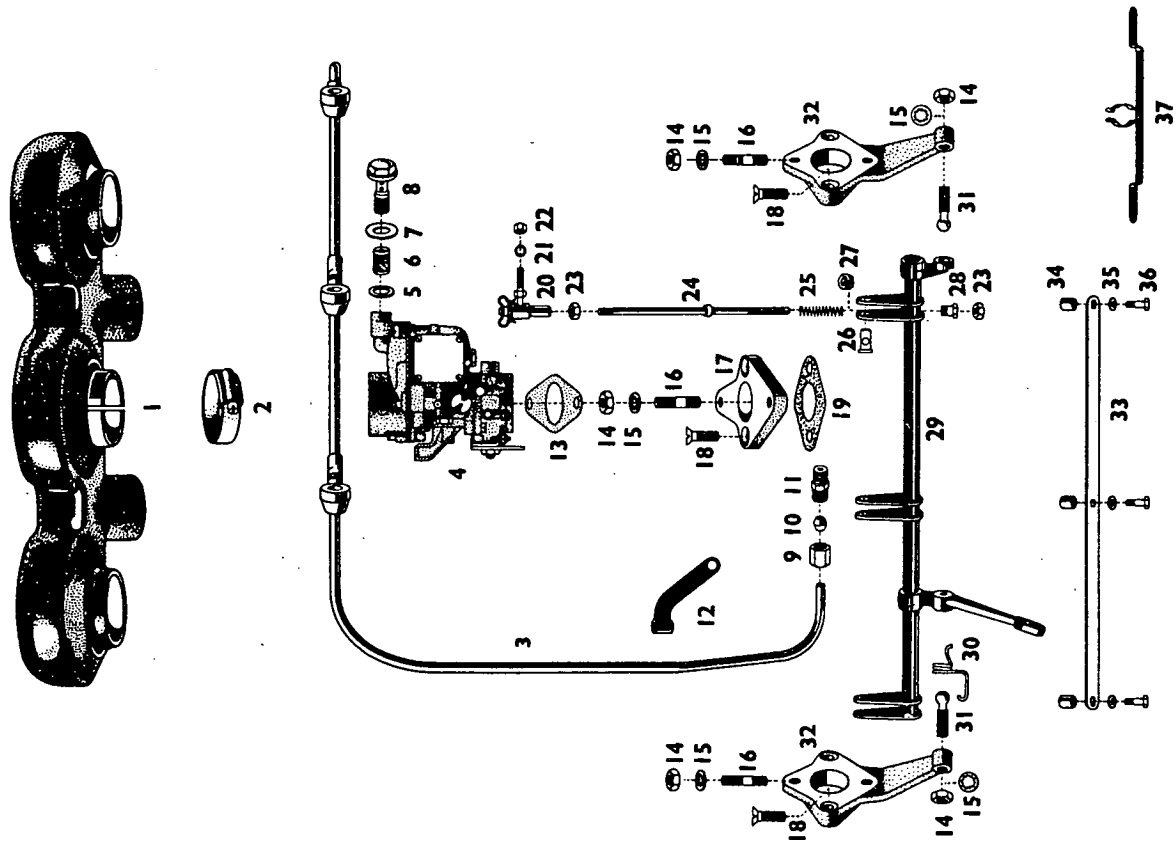
Tighten the bolts and turn up the ends of the lockplate to lock the bolts.

Solex Carburettors, Air Manifold, Carburettor Controls

Petrol Pump, Exhaust Manifold and Air Cleaner

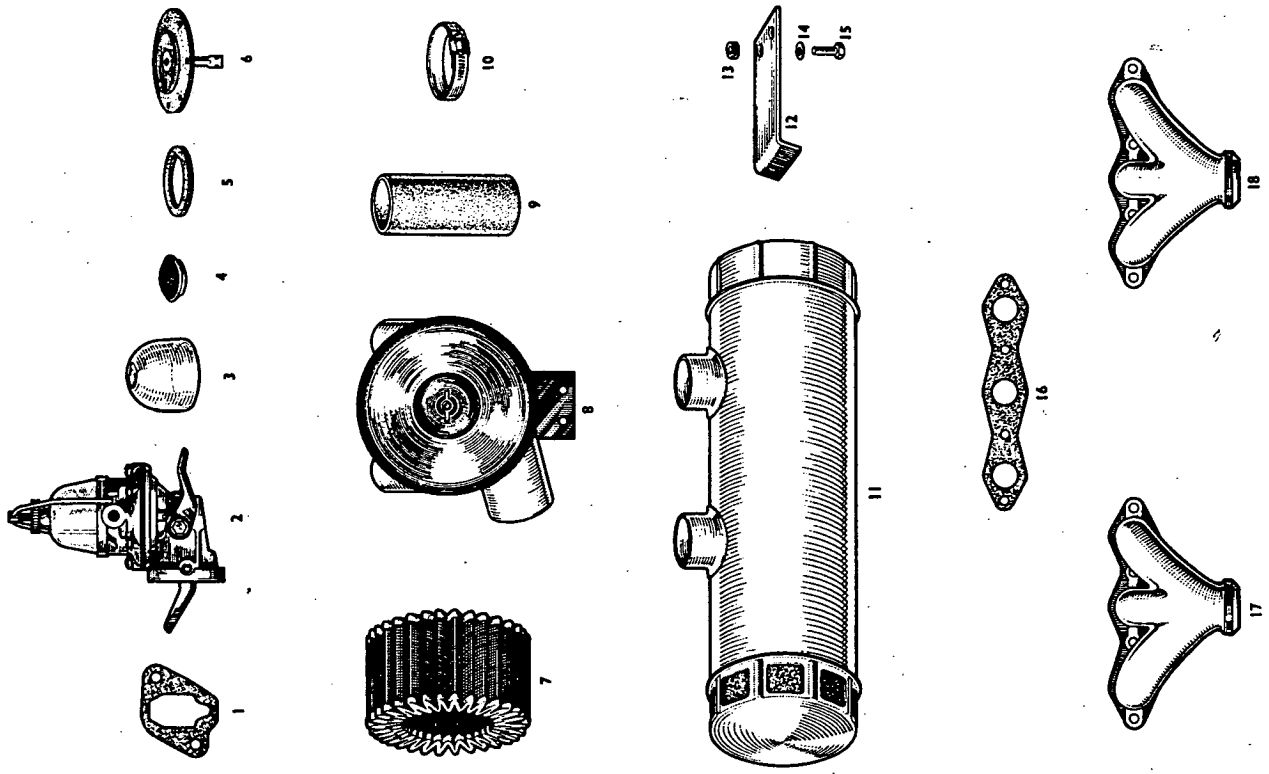
SOLEX CARBS. AIR MANIFOLD. PETROL PIPE

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.373150	1	Air Filter Manifold	1	-	21	Shakeproof Washer 2BA	3
N.371850	2	Clip	1	-	22	Nut 2BA Std.	3
N.373160	3	Fuel Pipe Assembly	1	-	23	Locknut 2BA	6
N.374530	4	Carburettor - Solex - Centre) Used up to Chassis 4058	1	N.373030	24	Control Rod Unit.) Used up to Chassis 4136	3
N.374540	-	Carburettor - Solex - Inner & Outer) Used up to Chassis 4058	2	N.374900	-	Control Rod Unit.) Used on & after Chassis 4137	3
N.374920	-	Carburettor - Solex) Used on & after Chassis 4059	3	N.373080	25	Retaining Spring	3
				N.373090	26	Pivot Pin	3
N.372510	5	Fibre Washer - Small	3	N.373060	27	Spring Retainer	3
N.372490	6	Filter - Petrol Pipe	3	N.373110	28	Adjusting Screw	3
N.372500	7	Fibre Washer - Large	3	N.373140	29	Control Shaft Unit.) Used up to Chassis 4136	1
N.372480	8	Banjo Bolt	3	N.373460	30	Return Spring) Used up to Chassis 4136	1
N.371820	9	Union Nut	1	N.374870	-	Control Shaft Unit.) Used on & after Chassis 4137	1
N.371830	10	Olive	1	N.374890	-	Return Spring) Used on & after Chassis 4137	1
N.371810	11	Single Ended Union	1	N.373000	31	Fulcrum Adjusting Screw	2
N.373450	12	Fuel Pipe Clip	1	N.372990	32	Fulcrum Bracket.) Used up to Chassis 4136	2
N.373320	13	Joint - Carburettor	3				
FN.205/L	14	Nut 5/16" BSF	8	N.374850	-	Fulcrum Bracket.) Used on & after Chassis 4137	2
-	15	Shakeproof Washer 5/16"	8				
N.321760	16	Stud	6	N.373120	33	Tie Rod	1
N.373220	17	Centre Carb. Adaptor	1	N 373040	34	Distance Piece	3
N.373360	18	Screw 5/16" Csk. Hd. M.S.	6	FBS.72C	35	Washer	3
N.370170	19	Joint - Adaptor	3	-	36	Bolt 2BA 11/16" long	3
N.373470	20	Ball Joint	3	N.373370	37	H.T. Wire Clip	1



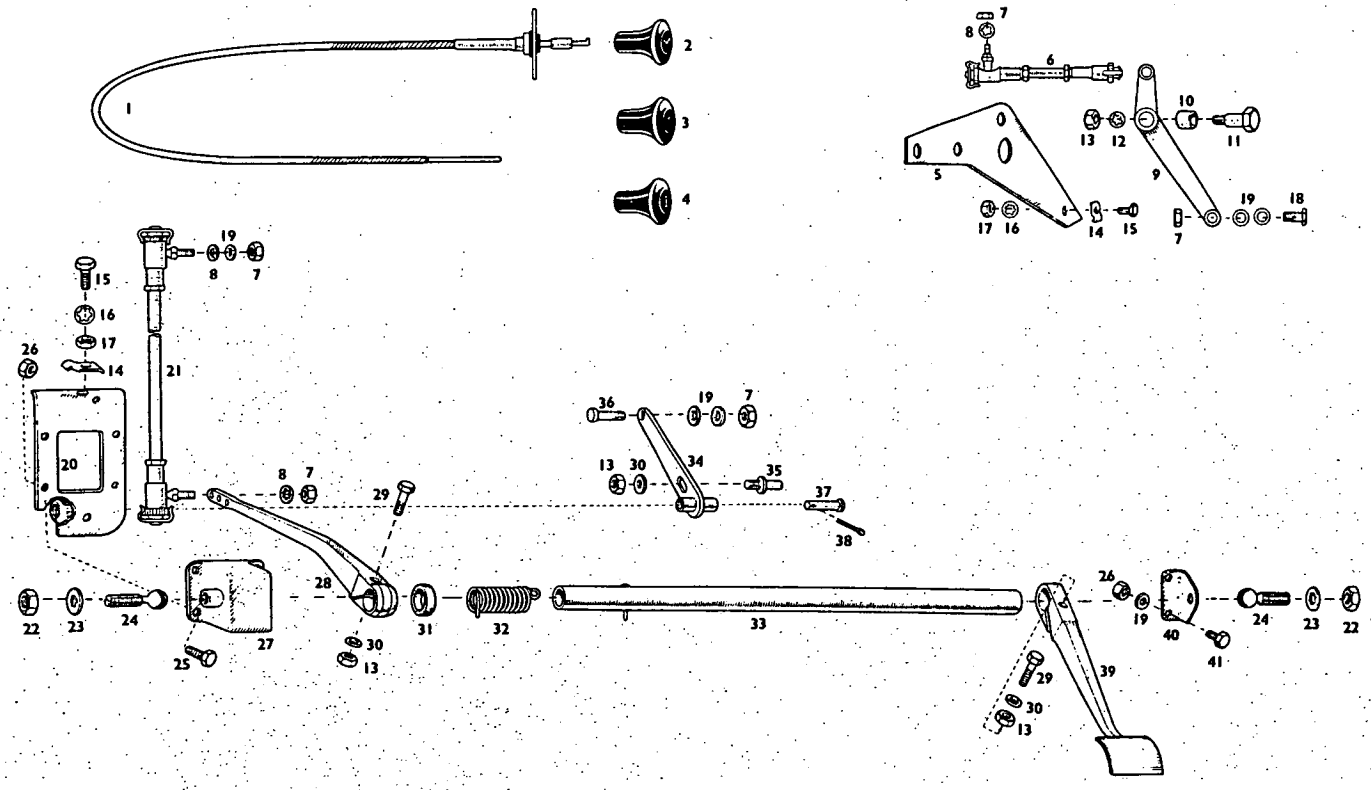
PETROL PUMP EXHAUST MANIFOLD AIR CLEANER

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.370040	1	Joint - Petrol Pump	1	N.374820	11	Air Cleaner)	1
N.370450	2	Petrol Pump	1	N.374830	12	Steady Bracket)	1
N.370480	3	Filter Cover	1	N.374840	13	Grommet) Chassis 4037	2
N.370490	4	Filler	1	-	14	Washer 5/16" Plain) onwards	2
N.370500	5	Gasket	1	FS105/6D	15	Setscrew 5/16" BSF)	2
N.370470	6	Diaphragm	1	N.370030	16	Gasket - Exhaust Manifold	2
N.371770	7	Element - Air Cleaner	1	N.370010	17	Exhaust Manifold LH.)	1
N.374010	8	Air Cleaner Unit) Used up to	1	N.370020	18	Exhaust Manifold RH.) 100 B2 Engine	1
N.374640	9	Intake Hose from Cleaner) Chassis 4036	2	N.374560	-	Exhaust Manifold (Six Branch)	
N.371850	10	Clip - Jubilee 2.3/8" Bore	4			(100 B Engine)	



TYPE 405. ENGINE CONTROLS R.H.D. AND L.H.D.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
-	1	Throttle Control)	1	N.710034	20	Backplate	1
		Lucas WG/16I/KD47/32119F) Used up		N.710050	21	Throttle Control Rod complete	1
-	-	Mixture Control) to	1			Used up to Chassis 4136	
		Lucas WG/16C/KD47/32350) Chassis		405-1-27010	-	Throttle Control Rod complete	1
-	-	Ignition Control) 2028	1			Used on and after Chassis 4137	
		Lucas WG/16I/KD47/32119F)		FN.205/L	22	Nut 5/16 BSF	2
				-	23	Washer 5/16 Shakeproof	2
-	-	Throttle Control)	1	N.373000	24	Fulcrum Adjusting Screw	2
		Lucas WG/16T/KD54/32398A) Used on		-	25	Bolt 2BA Hex Hd ½ long	4
-	-	Mixture Control) and from	1	-	26	Nut 2BA Simmonds C.P.I.	6
		Lucas WG/16M/KD54/32399A) Chassis		N.710039	27	Control Box	1
-	-	Ignition Control) 2029	1	N.710042	28	Throttle Control Lever	1
		Lucas WG/16I/KD54/32397A)				Used up to Chassis 4136	
				405-1-27012	-	Throttle Control Lever	1
404-1-63010/1	2	Operating Knob - Engraved 'M'	1			Used on and after Chassis 4137	
404-1-63010/2	3	Operating Knob - Engraved 'T'	1	FB.104/8D	29	Bolt ¼ BSF 1 long	2
404-1-63010/5	4	Operating Knob - Engraved 'I'	1	-	30	Washer ¼ dia. Plain	2
N.710060	5	Mounting Plate	1	N.710047	31	Sealing Washer	1
N.710061	6	Ignition Control Rod complete	1	N.710041	32	Return Spring - RH Drive	1
-	7	Nut 2BA Plain	6	N.710057	-	Return Spring - LH Drive	1
-	8	Washer 2BA Shakeproof	4	N.710036	33	Control Shaft complete	1
N.710054	9	Ignition Lever	1	N.710035	34	Hand Throttle Control Lever	1
N.540251	10	Oilite Bush	1	N.710058	35	Throttle Lever Lift	1
N.540271	11	Bolt	1	N.710052	36	Pin	1
-	12	Washer ¼ dia. Shakeproof	1	N.710044	37	Pivot Pin	1
FN.104/K	13	Nut ¼ BSF	4	-	38	Split Pin 1/16 dia. ½ long	1
N.710037	14	Cable Clamp	1	404-1-27001	39	Accelerator Pedal	1
-	15	Bolt 4BA Hex Hd 3/8 long	1			Used up to Chassis 4136	
-	16	Washer 4BA Shakeproof	1	405-1-27011	-	Accelerator Pedal	1
-	17	Nut 4BA Simmonds B.P.I.	1			Used on and after Chassis 4137	
N.710052	18	Pin	1	N.710038	40	Control Shaft Bracket	1
-	19	Washer 2BA Plain	7	-	41	Bolt 2BA Hex Hd 5/8 long	2



Solex Carburettors, Air Manifold, Carburettor Controls

Petrol Pump, Exhaust Manifold and Air Cleaner

Removing and Refitting Carburettors

Loosen the hose clip connecting the air filter manifold to the centre carburettor and the hose clips connecting the hoses to the air cleaner and remove the manifold.

Detach the petrol pipe from the carburettors carefully retaining the fibre washers, gauze filters and banjo bolts.

Disconnect the throttle controls rods from the control shaft by removing the locknuts and retaining nuts. Replace the nuts after removal for safe keeping.

Disconnect the Bi-starter control wire and clip from the centre carburettor and remove the tie rod from all the carburettors.

Preferably mark each carburettor so that it can be refitted to the same flange, then remove the six flange nuts and spring washers. Lift the ignition H.T. leads and clip away and lift off each carburettor together with its throttle linkage.

Before refitting the carburettors check that the cylinder head and carburettor flanges are clean and flat. Then proceed as follows:-

Fit a new gasket to each flange.

Refit the carburettors into their original positions with the control rods lying above the control shaft. Position the H.T. leads and clip between the front and centre carburettors then fit the spring washers and nuts and tighten.

Refit the Bi-starter tie rod and fit the control rod to the centre carburettor. Adjust the wire so that the levers are against their stops before the dashboard knob is seating.

Connect the throttle control rods to each lever on the control shaft.

Connect the petrol pipe to the carburettors. Be sure that the banjo filters are clean and that the fibre washers are in good condition.

Refit the air filter manifold and tighten the hose clips.

Finally check the synchronisation of the throttle. This is essential.

Carburettors

Type.....Solex 32BI.

Settings

All Type 404 Cars and Type 405 Cars up to Chassis 4058.

Centre Carburettor. Solex 32BI/1705		Inner & Outer Carburettor. Solex 32BI/1704	
Choke	26	Choke	26
Main Jet	120	Main Jet	115
Correction Jet	190	Correction Jet	190
Pilot Jet	45	Pilot Jet	45
Air Bleed	1.0	Air Bleed	1.2
G.A. Jet	2.0 m/m	G.A. Jet	2.0 m/m
G.S. Jet	95	G.S. Jet	95
Emulsion Tube	No.10	Emulsion Tube	No.10
Needle Valve	1.5	Needle Valve	1.5

Type 405 Car Chassis 4059 onwards.

All 3 Carburettors are similar. Solex 32BI/1763

Choke	26
Main Jet	115
Correction Jet	200
Pilot Jet	45
Air Bleed	1.0
G.A. Jet	2 m/m
G.S. Jet	95
Emulsion Tube	No.10
Needle Valve	1.5

With the possible exception of Jet sizes all three carburettors are identical, each incorporates a Solex Bi-starter, the starter controls being interconnected and controlled in unison by a knob on the dashboard marked "M".

Each stage of carburation (i.e. starting, slow running and running) has its own petrol jet and air jet, this enables mixture corrections to be made to any one "stage" without disturbing the other two, but each stage must be "blended" into the next by final adjustment.

The three sections of the main carburettor are bolted together and comprise:-

1. The top, consisting of the float chamber cover containing the needle valve assembly, the intake extension and Bi-starter air ducts.

2. The centre which contains the choke tube, air and petrol jets and the float chamber.

3. The base, which is the throttle valve chamber and contains the volume control screw for slow running, as well as the starter delivery ducts.

Bi-starter

The Bi-starter housing is secured to the left-hand side of the carburettor body. The assembly is illustrated in Fig.28 and shown diagrammatically in Fig.29 The Bi-starter valve is mounted in the chamber formed between the housing and the carburettor body, the valve spindle being operated by a lever. A spring holds the valve against its seating on the body, a spring-loaded ball locating the valve in its intermediate setting.

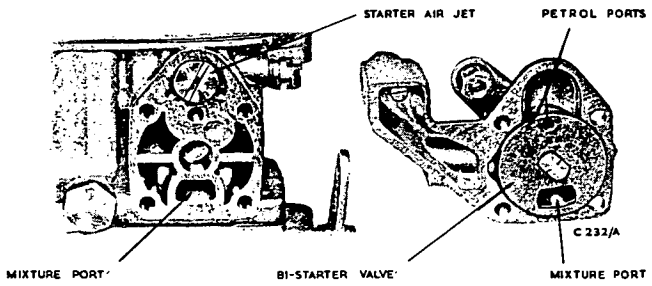


Fig. 28. Bi-starter assembly

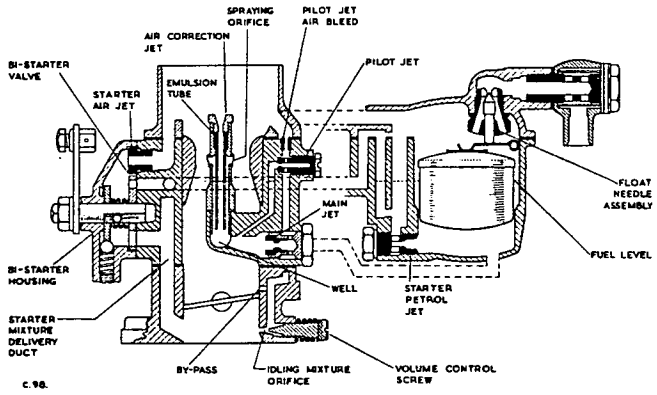


Fig. 29. Diagram of carburettor

The control knob on the dashboard actuates an enclosed push/pull wire connected to No.2 (centre) carburettor, a coupling bar linking this carburettor with the other two carburettors. There are three distinct positions of the control i.e.

Full out.....Full rich for cold starting.

Intermediate.....Initial warming-up period to enable driving off on a cold engine.

Full in.....Bi-starter out of action.

The valve has two adjacent petrol ports, while diametrally opposite is the mixture port, see Fig. 28 When the valve is turned to the "cold starting" position, the larger port registers with the petrol delivery port in the carburettor body, and the full output of petrol from the starter petrol jet enters the Bi-starter chamber. This jet is situated at the base of the float chamber, adjacent to the Bi-starter assembly. When the valve is turned to the intermediate position, the smaller petrol port registers with the petrol delivery port and restricts the flow of petrol from the jet. The volume of air for both valve positions is controlled by the starter air jet, the air enters the chamber and the resultant petrol/air mixture passes through the mixture port and enters the induction system below the carburettor throttle butterfly, see Fig.29 It is thus imperative for the correct functioning of the Bi-starter that the throttle is fully closed otherwise the necessary depression in the Bi-starter will not be obtained. The richest mixture is required only for the initial start. When the engine has fired and "picked-up" the starter well becomes empty and the supply is then restricted to the output of the starter petrol jet. At the same time, with the increase in r.p.m., a larger volume of air is drawn through the starter air jet thereby weakening the mixture to its correct proportions and counteracting any tendency to over dose the engine cylinders.

Slow-running

Referring to Fig.30 petrol is drawn from the well through the vertical channel is the choke housing leading to the pilot jet which meters the petrol drawn into the air stream entering the pilot jet air bleed above it. The petrol/air mixture then passes downwards to emerge into the main induction tract through the slow-running mixture orifice below the throttle butterfly.

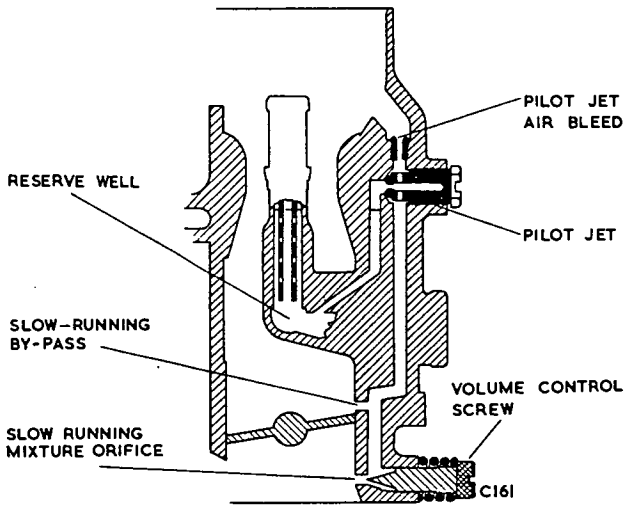


Fig. 30. Diagram of slow running

The effective area of the slow running mixture orifice is controlled by the spring-loaded volume control screw, the slow-running of the engine is thus controlled without disturbing the succeeding mixture range. Turn the volume control screw IN (clockwise) to weaken, and OUT (anti-clockwise) to richen the mixture.

When the throttle is closed to the slow-running position, the slow-running by-pass is on the atmospheric side of the butterfly and therefore is not subject to induction depression. Under these conditions, air enters the by-pass and further emulfifies the mixture. When the throttle is opened wider, the by-pass becomes subject to induction depression and its function changes, the by-pass now acting as a delivery orifice in addition to the slow-running mixture orifice, thus preventing a flat spot which might otherwise intrude.

Main Throttle Range

For the main throttle range control, the choke tube size should not be altered except for specialised requirements, and then only after consultation.

The sequence of operation in this range is as follows:

Referring to Fig.29 when the engine has been started and the throttle opened beyond the slow-running range, air is drawn through the choke tube venturi. The depression in the venturi draws petrol from the spraying assembly through the spraying orifices and the resultant mixture passes to the induction system.

As the throttle is opened further, the depression at the choke tube venturi increases, lowering the level of petrol in the spraying assembly until the upper holes in the emulsion tube are uncovered. Air is now drawn down the emulsion tube through the air correction jet, emerges from the upper holes and passes up the outside of the emulsion tube to emerge through the spraying orifice, thus maintaining the correct petrol/air ratio.

Progressive opening of the throttle increases the depression in the choke and more petrol is drawn from the well, but as the petrol level in and around the emulsion tube is lowered, the emulsion tube holes are uncovered progressively, permitting more air to enter and balance the mixture to its correct proportions. When the well is empty, the fuel supply is governed by the main jet alone. Fig.29 indicates that the air will discharge through the emulsion tube at right angles to the upward flow of petrol from below, thus offering resistance to the output of petrol from the well.

Dismantling Carburettors

It is advisable to replace the gaskets during dismantling, the necessary gaskets are:-

Solex Part No. 52787. Float Chamber Cover Gasket.
Solex Part No. 52788. Throttle Chamber Gasket.

1 of each required per Carburettor.

To dismantle, remove the float chamber retaining screws and lift off the cover see Fig.31, if necessary unscrew and remove the needle valve assembly.

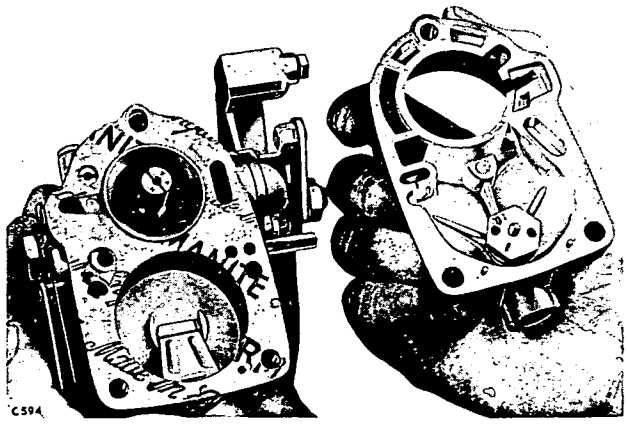


Fig. 31. Removing carburettor float chamber cover

Lift out the float toggle, spindle and float.

Unscrew the air correction jet see Fig.32 and extract

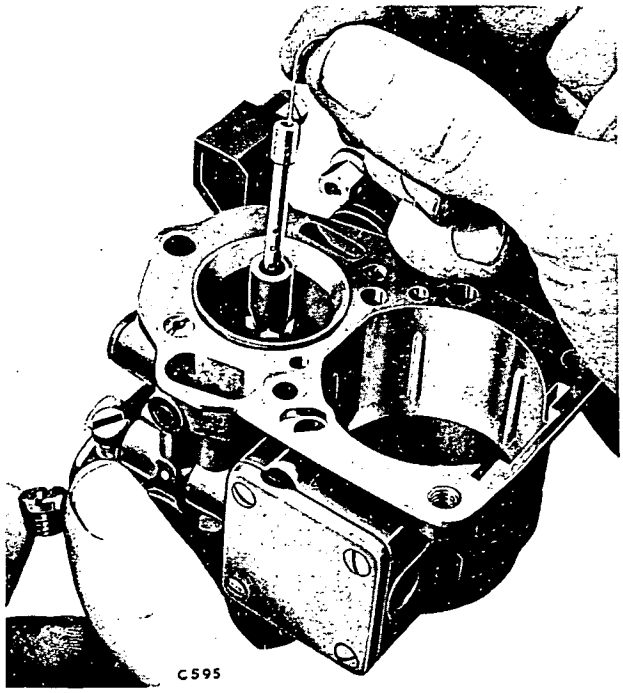


Fig. 32. Extracting correction jet and emulsion tube

the emulsion tube. Slacken off the choke locating screw and remove the choke Fig.33 Unscrew the pilot jet air

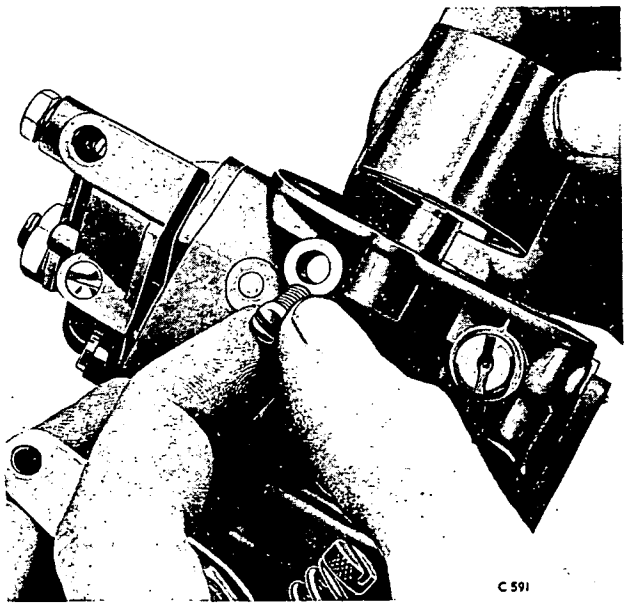


Fig. 33. Removing choke

bleed and the pilot jet. Remove the main jet holder and from it unscrew the main jet. Remove the Starter jet. See Fig.34. Remove the four cheese head screws securing the Bi-starter assembly and remove the assembly, no

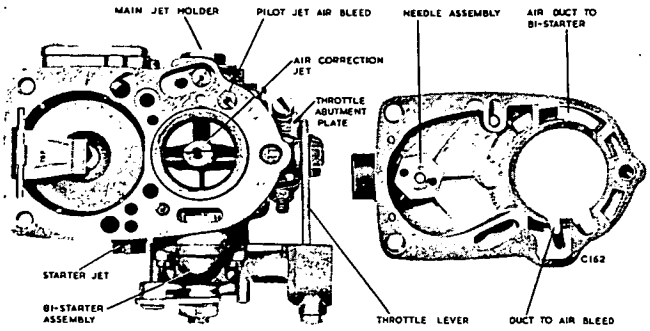


Fig. 34. Jet and float chamber arrangement

gasket is fitted. Fig.35

Remove the starter air jet from the Bi-starter attachment face.

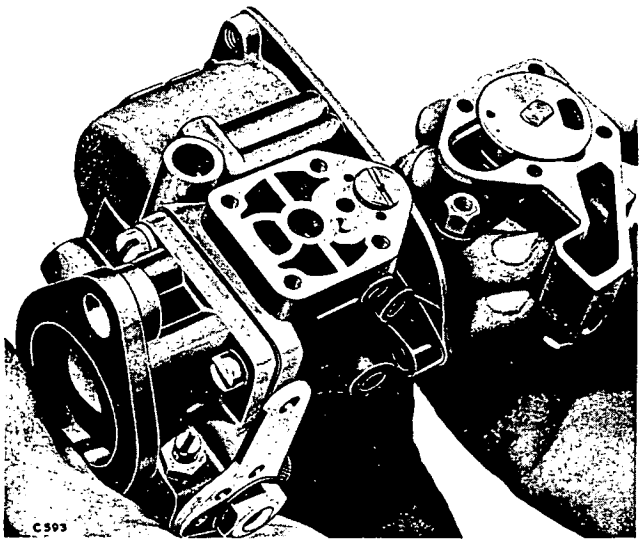


Fig. 35. Removing bi-starter from carburettor

Separate the throttle chamber from the float chamber assembly by removing the four cheese head screws. If the two sections will not easily separate, lever gently between the bottom of the float chamber and the throttle spindle boss. Fig.36 Dischard the gasket.

Remove the volume control screw and its spring.

Reconditioning

Thoroughly wash off and clean all the parts. Replace such parts as worn butterfly spindles. Examine the volume control screws and replace any with the point bent or scored.

Check all mating faces for flatness together. Particularly check the face of the Bi-starter brass plate on to its contact face and if necessary lap with lapping compound until a good face is obtained. This is an important point and will repay careful attention. Wash away all traces of abrasive.

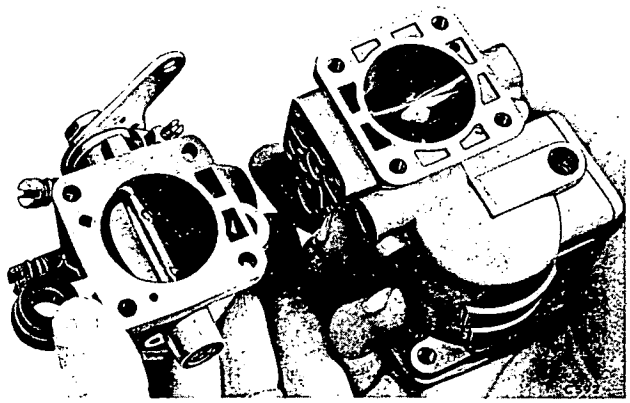


Fig. 36. Separating float and throttle chambers

Re-assembly

Lightly oil the threads then fit the volume control screw and spring.

Assemble the throttle chamber to the float chamber assembly, using a new gasket and secure with its four screws. The gasket may be fitted either way round. Insert the choke with the numbered end to the top and insert and tighten the choke locating screw.

Refit the startet jet (marked Solex starter) and refit the starter air jet (marked Solex Air 2)

Refit the Bi-starter assembly, no gasket is fitted. Ensure that it is inserted in the housing the correct way up, i.e. with the slot to the bottom and the lever facing upwards, see Fig.28

Refit the Main Jet to its holder (marked main jet holder) and refit to the carburettor. Fit the pilot air bleed.

Refit the pilot jet. It is most important to ensure that the inner end seats before the head abuts the housing. If it does not, relieve the casting by careful filing to provide a clearance between the head and the housing as shown in Fig.37

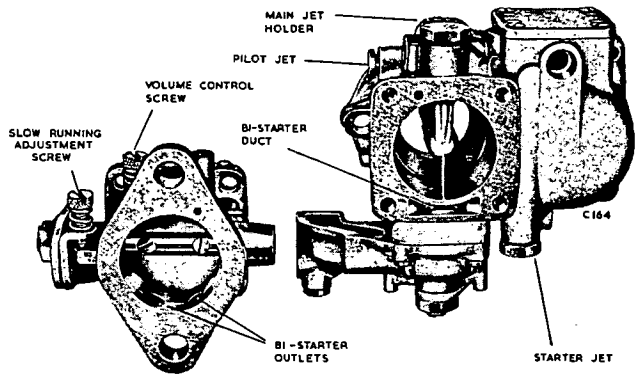


Fig. 37. Pilot jet

Insert the emulsion tube into the spraying well and fit the air correction jet above it.

Replace the float, it will only fit correctly one way.

Fit the spindle to the float toggle and position in its location slots, one side of the toggle is marked "TOP".

Check that the fibre washer is in good condition and fit the needle valve assembly to the float chamber cover.

Fit a new float chamber cover gasket and replace the float chamber cover, ensuring that the two small dowel pegs enter their location holes correctly and that the cover is correctly positioned before tightening the three slotted hexagon head screws.

With the butterfly held closed by its lever set each slow running adjusting screw until the screw just touches its stop and then turn in 1 turn further.

Set each throttle to the full open position, then set the stop screw to about its stop with the throttle parallel with the choke axis, when set, tighten the stop screw locknut.

Carburettor Tuning and Synchronisation

Refitment of the carburettors may alter the carburettor positions relative to the control shaft, for this reason it is most important to check the synchronisation of the throttles. Check also that the Bi-starter control lever on each carburettor is against its fully closed stop before the control knob "M" abuts the instrument panel.

Any adjustment made to one carburettor must also be made on the other two.

It cannot be emphasized too strongly that it is useless to attempt to adjust and synchronise multiple carburettors unless other adjustments are perfect, i.e. the tappets set correctly and the contact breaker points clean, dry and set to their correct gap, the sparking plugs must also be in good order, clean and the gaps set correctly.

In the normal course of events, the choke tubes, petrol and air jets should not be altered unless the car is to travel in barometric conditions differing from those of the British Isles, or a different quality fuel is used.

Caution:- Some grades of fuel produced a hard crust-like deposit in the carburettors, remove this from time to time, and keep the petrol filters in good condition.

With increase in altitude, the carburettor mixture becomes richer. In theory, this amounts to a 17.1/2% increase in mixture strength for every 6,000ft. altitude gained. Varying qualities of fuel must also be taken into account. In practice, and as a guide, it may be taken that the standard setting of jets remains effective up to 3,000ft. thereafter for every additional 3,000ft. of altitude, a main jet one size smaller may be used with a possible corresponding increase in the size of the air correction jet. Loss of power is inevitable as altitude is increased, this cannot be regained by carburettor adjustment.

The following sequence is given as a guide to the correct selection of jets etc:-

Starting

If the engine does not start almost immediately when it is cold and the Bi-starter control is fully OUT (full rich), alter the petrol starter jets only. Do not alter the air jets inside the Bi-starter assemblies since these jet sizes are determined on a cylinder capacity basis.

Should the starting mixture suddenly appear excessively rich, check that the startet air jet on one or more carburettors (or the two small holes on either side of it) are not obstructed.

Never use the full rich position to start a warm engine. If the engine will not start with the Bi-starter control in the off (IN) position, use the intermediate position, which can be felt by the "click" of the spring-loaded ball in the assembly.

Slow-running

The essential feature of the slow-running speed setting is to obtain exact synchronisation of the three throttles. Two methods of setting the slow-running are given below, Method "A" being recommended when specialised equipment is not available, and method "B" which is that employed by the Company. With both methods, refer to Fig.38

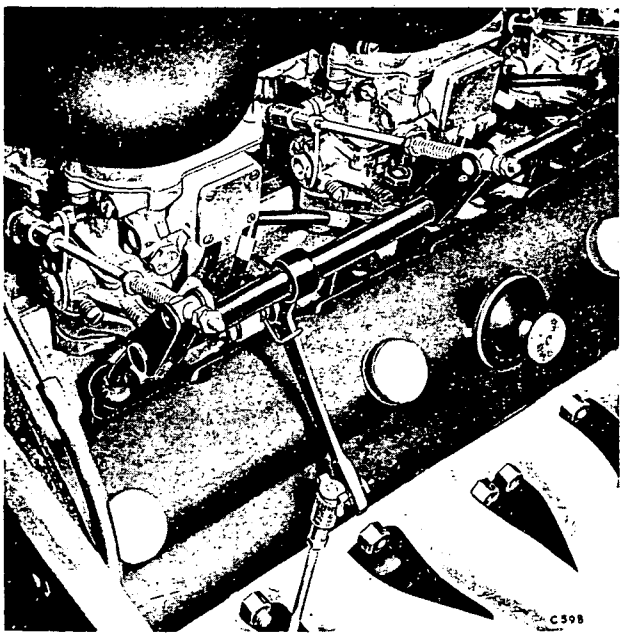


Fig. 38. Throttle control adjustment

Method "A".

Disconnect the spring-loaded ends of the three control rods from the control shaft and check that there is no backlash at the ball-joint ends on the carburettor throttle levers. If there is backlash, tighten the adjustments fully then loosen one "click". Check that there is at least 1/8 in. clearance between the manually operated throttle control lever and its point of contact with the accelerator control arm when the control knob "T" is fully in.

Remove the air cleaner manifold then check that each throttle butterfly is fully open when its lever is against its fully open stop.

Close each throttle in turn by finger-pressure, screw back each slow-running adjustment screw until it is just

clear of its abutment then, with a strip of thin paper inserted between the screw and its abutment, turn in the screw until the paper is just nipped. Then turn each screw IN one complete turn.

Note: Do not use feeler gauges for this purpose, since on used carburettors, the slow-running screws may have caused indents on their respective abutments to a varying degree.

Insert No. 3 control rod into its pivot pin on the control shaft lever and, with the accelerator pressed lightly to the floor, screw the adjusting nut on to the control rod until it just abuts the pivot pin, at this setting, the spring should just be nipped. Fit the locknut to the control rod, but do not tighten at this stage.

With the accelerator pressed hard down to the floor, check that when the throttle (No.3) is against its fully open stop, the spring on its control rod is compressed sufficiently only to relieve the load on the adjusting nut. Release the accelerator.

Connect No.2 control rod to the layshaft and, with a strip of paper between the spring-loaded slow-running adjustment screw and its abutment, tighten the control rod adjusting nut until the paper strip is just nipped. Fit the locknut but do not tighten at this stage. Repeat on No.1 carburettor.

Open the throttles fully by means of the control shaft lever and check that each throttle is against its respective stop at the same moment. Check also that when the accelerator is pressed hard to the floor, each spring at the control rod adjustment is compressed to the same extent, i.e. just relieving the load on the nuts.

With a strip of thin paper trapped between each slow-running adjustment screw and its abutment, carefully open the throttles by the manual control (pull out knob "T" on instrument panel) to an extent where the 3 strips of paper can be withdrawn with the same "feel" of resistance. If any one strip of paper is gripped more tightly than its neightbour, adjust only on the adjustment nut of the relevant control rod. When all three are satisfactory, secure the control rod adjusting nuts with the locknuts, and re-check. The throttles are now synchronised.

Turn each volume control screw right home (do not use force or the seatings will be damaged) and then turn each back 1 turn.

Start up the engine and adjust the manual throttle control to give approximately 1,000 r.p.m. and run at this setting until 70°C water temperature is reached.

Note:- If the slow-running mixture is obviously wrong after the Bi-starter control has been pushed fully home, adjust the volume control screws by equal increments as necessary. A weak mixture is indicated by a tendency to stall after erratic running, an overrich mixture causes "hunting", a strong smelling exhaust, and the engine rocking violently in its mountings. Turn the volume control screws IN (clockwise) to weaken and OUT (anti-clockwise) to richen the mixture.

When the water temperature has reached 70°C, push home the throttle knob on the dashboard and adjust each slow-running adjustment screw by equal amounts one way or the other as necessary to give an idling speed of 750 to 800 r.p.m. Then adjust each volume control screw by equal amounts until smooth idling is achieved within this range of r.p.m. The exact idling speed obtainable is dependent on the general condition of the engine, e.g. presence of carbon etc.

Caution:- Never adjust the slow-running adjustment screw and the volume control screw on one carburettor at a time, but adjust each slow-running adjustment screw in turn and then each volume control screw in turn.

Once the throttles have been synchronised, there is no need to disturb the linkage. For normal adjustment to the slow-running, merely re-set the three slow-running adjustment and the three volume control screws.

Method "B"

The panel illustrated in Figs.39 & 40 provides a visual indication which enables accurate carburettor synchronisation to be obtained, it can be made locally to the dimensions shown in the illustrations of special tools and equipment.

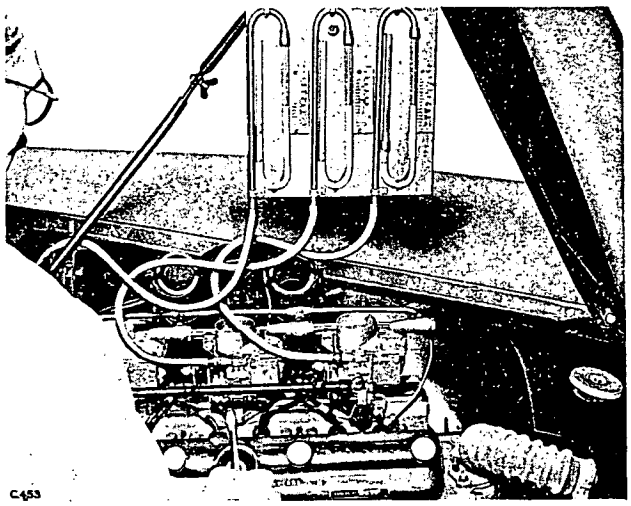


Fig. 39. Carburettor synchronising panel

The panel carries three "U" tubes on its front face, the scale at the side of each tube being calibrated according to the specific gravity of the fluid employed in the tubes. Red-X is recommended for the purpose, and the scale readings quoted are obtained with this fluid. It should be noted however, that the readings will also depend on the condition of the engine.

Behind the panel are a number of brackets to carry the necessary adaptors, the master pilot jets etc.

Remove the air cleaner and manifold.

Working from the right hand side of the engine, screw the volume control screws on all carburettors right home, then screw them out one complete turn.

Caution:- Do not force these screws home or the seatings may be damaged.

At the carburettor end of each of the three control

rods, tighten the ball joint adjuster, then slacked it one notch. Check that there is at least 1/8 in. clearance between the manually-operated throttle control lever and its point of contact with the accelerator control arm when the control knob "T" is fully in.

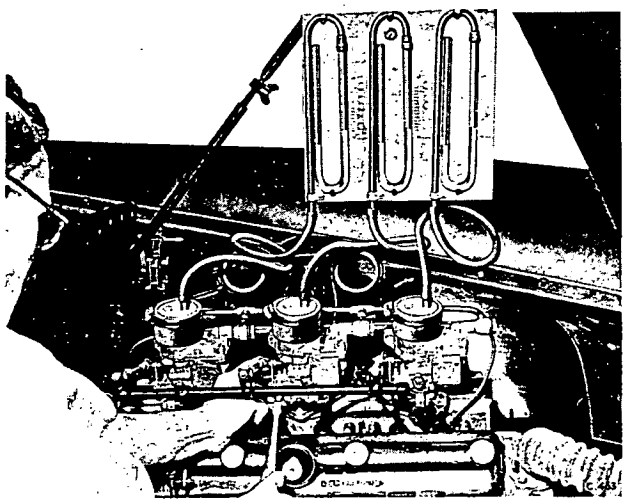


Fig. 40. Carburettor synchronising panel

Start the engine and run at about 1,000 r.p.m. until the water temperature is not less than 70°C. When this temperature has been reached, shut down the engine to about 800 r.p.m., if necessary, temporarily adjusting the slow-running adjusting screws.

Note:- During the process of tuning, the water temperature will probably rise, it is advisable therefore to ensure free entry of air to the radiator. Do not allow the water temperature to rise above 90° C.

Fit the relevant adaptor over each carburettor intake and connect each adaptor to one of the "U" tubes with rubber tubing.

Starting on the centre carburettor, apply finger-pressure to the end of the control rod ball joint and turn back the adjusting nut at the outer end just to release the load on the spring. Hold the throttle against its slow-running stop, and, with a screwdriver, turn the slow-running adjustment screw of the carburettor as necessary until the lever of fluid in the relevant "U" tube registers exactly with the second graduation mark of its scale. Still retaining finger-pressure on the control rod end, screw down the adjusting nut on the outer end of the rod until it abuts the pivot pin. Release the finger-pressure on the rod, but check that in doing so, the reading on the "U" tube does not alter, if it does, re-apply the finger-pressure and screw down the adjusting nut very slightly and re-check the reading on the "U" tube. When satisfactory, secure the adjusting nut with its locknut.

Repeat this process on the other two carburettors and check finally that the fluid in all three "U" tubes gives the same reading, i.e. exactly on the second graduation mark. The throttle settings on all three carburettors are now synchronised.

Note: When screwing down the adjusting nuts on either of the two outer control rods, take great care not to overtighten them since this will result in slight opening of one or both of the remaining throttles, and so upset the true synchronisation as indicated on the scale readings.

Stop the engine, detach the tubing then remove the adaptors.

Remove the pilot jet from each carburettor, fit the kit master pilot jets and connect the rubber tubes from the "U" tubes to the master jets.

Start the engine. With the water temperature at not less than 70°C. and the engine slow-running, adjust the volume control screw of the centre carburettors until the level of fluid in the "U" tube registers exactly with the eighth mark on its scale. Repeat on the other two carburettors. The settings of the volume control screws on the three carburettors are now synchronised.

Stop the engine, remove the master pilot jets and refit the pilot jets.

Refit the adaptors to the carburettor air intake and re-check the throttle settings. If necessary re-adjust the throttle synchronisation.

The setting should produce an idling speed of approximately 800 r.p.m. dependent on the general condition of the engine. If the engine has been run-in correctly and is in good condition, it should be possible to obtain a slow-running speed of 750 r.p.m. if required. If, however, the slow-running speed is too high, adjust each slow-running adjusting screw by equal increments as required, then repeat the throttle synchronisation check described previously. Should the scale reading drop below two graduations to obtain the desired idling speed, 8 graduations must be retained when using the master pilot jet. Any variation from this setting will either richen or weaken the mixture and upset normal running.

The synchronisation completed, remove all test equipment and refit the manifold and air cleaner.

Running

Open the throttles smartly and note that the engine responds without spitting back, consistent spitting indicates weakness in mixture. If this cannot be adjusted on the volume control screws try a main jet one size larger.

The remainder of the throttle should be checked on the road preferably with a gradient which is well known. The fitment of a larger size main jet may upset the performance at wider throttle openings or consumption may be too great. In this case, try a size larger air correction jet. Fig.41 shows diagrammatically the sphere of influence of the main jet and air correction jet in relation to throttle position. It will be noted from the diagram that the petrol supply fed from below is represented by the total area below the heavy centre line, while the air supply fed from above is represented by the total area above the centre line. The shaded portions show respectively the influence of difference sizes of main jet and air correction jet. Thus a larger size main jet will increase the total area, i.e. the sum of the areas above and below the centre line by adding to the petrol side (enrichement) at smaller throttle openings. At the wider throttle positions, the mixture is corrected on the air correction jet, and alters the total area on the air side of the diagram.

Each successive stage of carburation must 'blend' into the next.

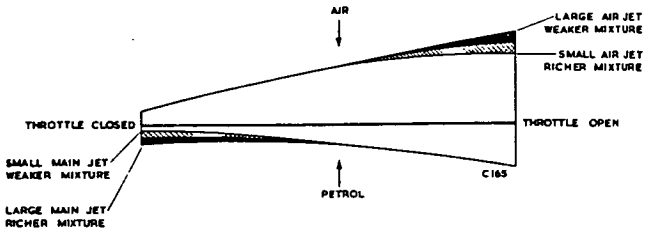


Fig. 41. Diagram of jet effect

Adjustment to the "top end" and "middle" is by selection of jets, but the extreme lower end (being adjustable) must be set to give a steady idling at 750 to 800 r.p.m. and at the same time enable the car to accelerate smoothly. Should hesitation with intermittent spitting back occur, turn each volume control screw OUT by increments of 1/4 of a turn at a time until no hesitation occurs on "pick-up". However, of the engine runs unevenly at small throttle openings but with no "spitback", this can often be overcome by setting No.1 and No.3 volume control screws IN about 1/2 a turn each, i.e. slightly rich setting on No.2.

Air Cleaner

A 'Vokes' dry element air filter is fitted to all Type 404 Cars and to Type 405 Cars up to Chassis 4036.

With this type of filter the element is contained in a large circular housing in two halves, held together by a central wing nut.

The filter should be cleaned every 10,000 (16,000 kilometers). Remove the element from its casing and clean out the inside of the half cases. Hold the element with the dirty side down and tap sharply to dislodge loose particles. If available clean with compressed air. Under no circumstances should liquid of any sort be used.

On Type 405 Cars Chassis 4037 onwards an AC. Combined Air Cleaner and Carburettor Intake Silencer was fitted.

This is illustrated in Fig.42

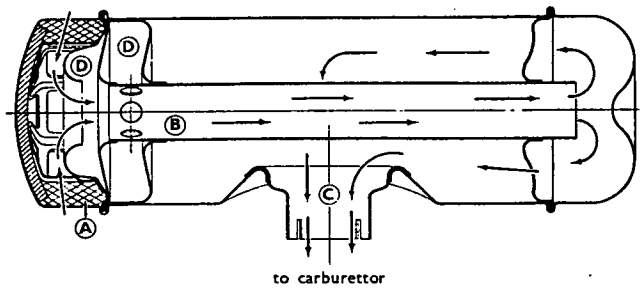


Fig. 42. A.C. combind air cleaner and carburettor intake silencer

Air entering the carburettors passes through an oil-wetted woven mesh (A), air tube (B) and central tube (C). Sound waves ordinarily would pass out of the carburettor into the car in the reverse way. In the AC. intake silencer, they pass into the main air chamber, the internal diameter and length of which, together with the carburettor and air tube characteristics, form a tuned silencer, and in addition into resonator chambers (D) each of which contributes towards eliminating or smoothing out the sound waves.

Cleaning and Re-oiling

See Fig.43 Each 5,000 miles the oil-wetted air cleaner portion needs cleaning and re-oiling.

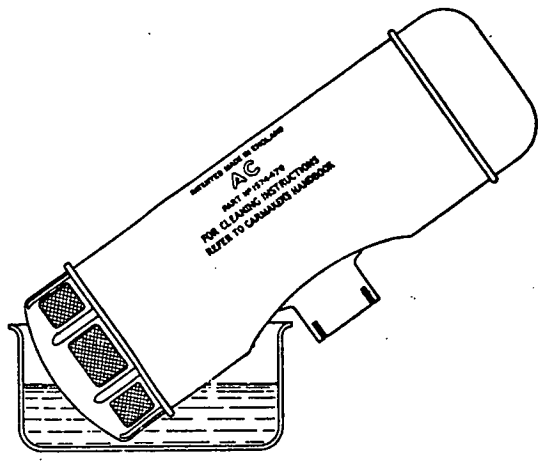


Fig. 43. Air cleaner servicing

This is best done by swilling the windowed end of the cleaner in a shallow pan of paraffin. After drying, the mesh should be lightly re-oiled with engine oil, allowing any surplus to drain off before refitting to the engine.

Petrol Pump

The petrol pump is a cam-driven A.C. type with a glass dome covered filter and hand priming lever.

No attention is normally required beyond periodically cleaning out the glass cover, cleaning or replacing the filter and replacing the cork gasket seating of the glass bowl. These operations can be carried out in situ by unscrewing the nut of the clamp retainer, see Fig.44

Should the pump be in poor condition a new or makers reconditioned unit is recommended.

Parts normally required for pump maintenance are:-

Bristol Part No.	A.C. Part No.	Description
N.370450	1524516	Petrol Pump Unit.
N.370470	856966	Diaphragm.
N.370480	1524247	Filter Glass Cover.
N.370490	1524250	Filter Gauze.
N.370500	1524246	Cork Gasket.

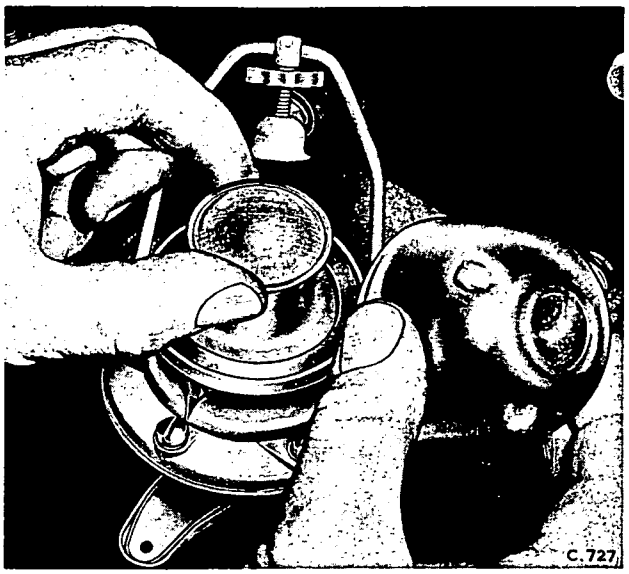


Fig. 44. Removing petrol pump filter

Removing the Pump from the Engine

Turn off the petrol supply at the chassis end of the pump flexible pipe.

Disconnect the flexible and fixed petrol pipes, then remove two nuts and spring washers securing the pump to the engine.

Dismantling to Replace the Diaphragm

Remove the six cheese head screws securing the two halves of the pump together Fig.45

To remove the diaphragm ease the edges from the body with a knife, press down firmly on the steel centre plate and twist either way about half a turn. This will release the diaphragm spindle from its slot in the operating lever and it will be forced up by the pressure of the spring.

Before fitting a new diaphragm check the faces of the two halves together and file or lap if necessary.

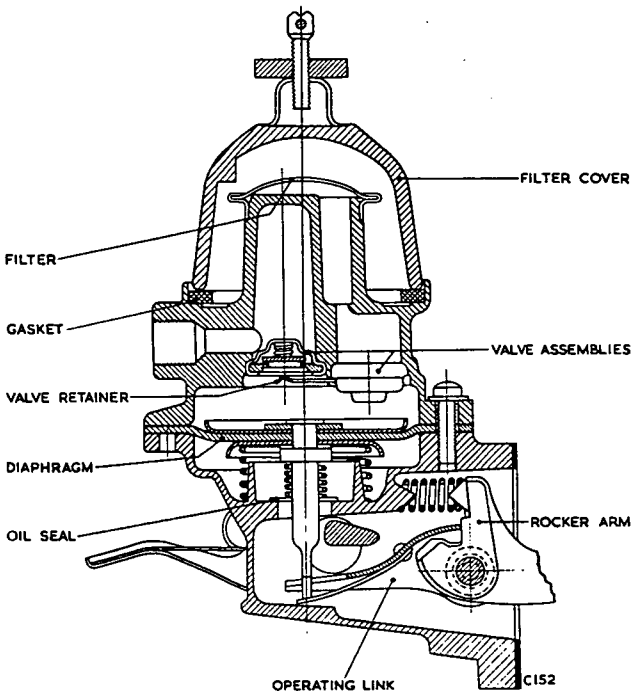


Fig. 45. Petrol pump assembly

Replace the smaller spring, cup and oil seal washer on the new diaphragm, position the pump pressure spring and press the diaphragm down and rotate it to locate it in the operating lever slot. The diaphragm and lower pump body have a small protruding piece to indicate their relative positions.

Replace the top half and tighten the six screws evenly.

Refitting the Pump to the Engine

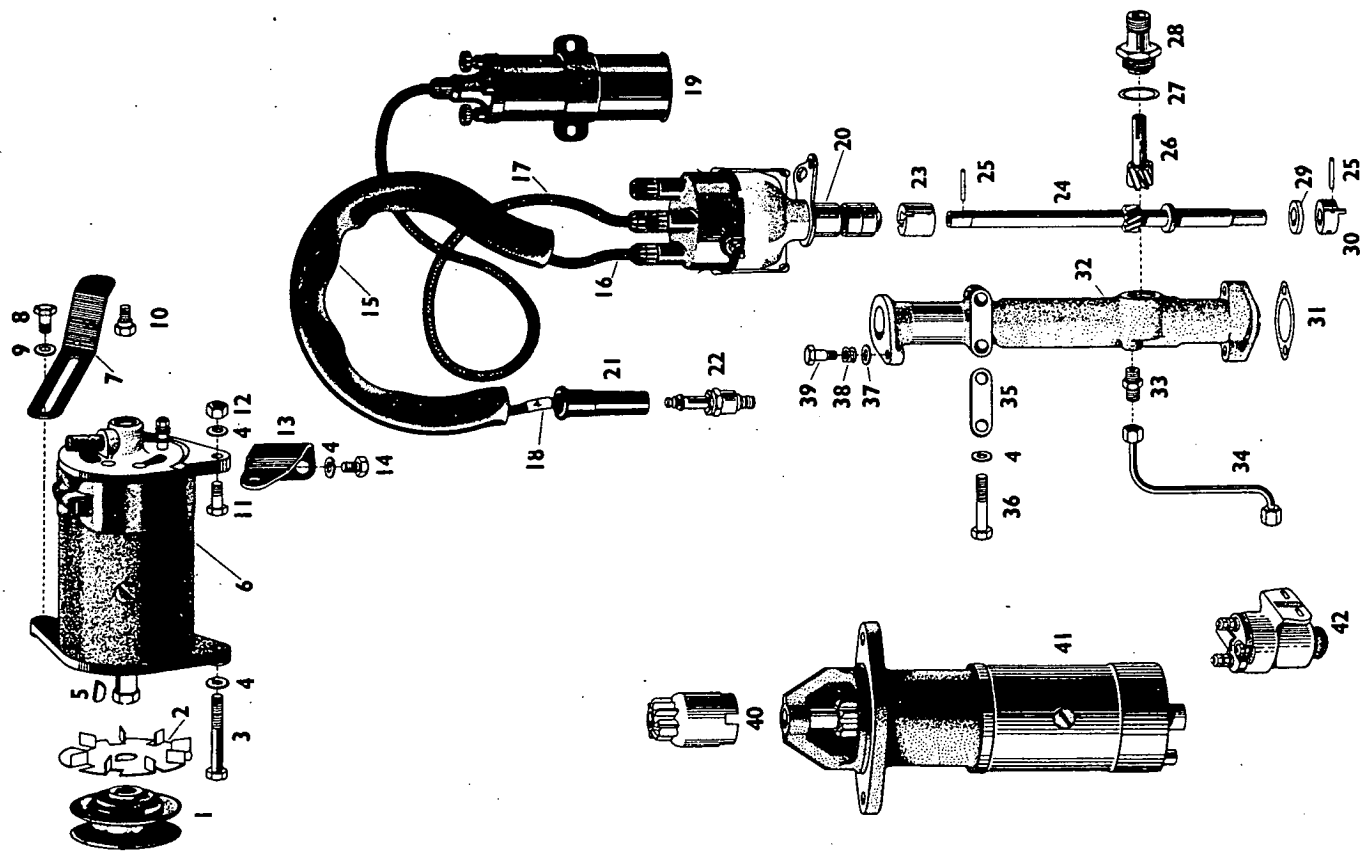
Before refitting the pump be sure that both the cylinder block and pump faces are clean. Smear a new gasket with grease and position on the block. Fit the pump and spring washers and tighten the nuts evenly.

Connect the fuel pipes, turn on the petrol supply and hand prime the supply to the pump.

Engine Electrical Group

DYNAMO. STARTER. DISTRIBUTOR. COIL.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.390610	1	Dynamo Pulley Unit	1	-	22	Spark Plug KLG type P/TEN/L70	6
N.390580	2	Fan (Dynamo)	1	N.380430	23	Driving Dog (top)	1
WB.105/21D	3	Dynamo Securing Bolt	1	N.380450	24	Distributor Drive Shaft	1
AGS.585/E	4	Spring Washer	6	N.380420	25	Driving Pin	2
N.390320	5	Key (Dynamo)	1	N.380090	26	Rev. Counter Drive Shaft	1
N.390740	6	Dynamo - Lucas C39.PV/2	1	N.380100	27	Rev. Counter Drive Joint	1
N.390560	7	Dynamo Adjusting Bracket	1	N.380080	28	Rev. Counter Drive Body	1
N.390490	8	Fulcrum Bolt	1	N.380380	29	Thrust Washer .105 thickness	as reqd
N.390500	9	Fulcrum bolt Washer	1	N.380390	-	Thrust Washer .102 thickness	" "
N.390050	10	Dynamo Bracket Screw	1	N.380400	-	Thrust Washer .099 thickness	" "
FB.105/7D	11	Fulcrum Bracket Bolt	1	N.380410	-	Thrust Washer .095 thickness	" "
FN.105/L	12	Fulcrum Bracket Nut	1	N.380440	30	Driving Dog (bottom)	1
N.390570	13	Fulcrum Bracket	1	N.380110	31	Distributor Casing Joint	1
WS.105/5D	14	Fulcrum Bracket Securing Screw	2	N.380010	32	Distributor Drive Casing	1
N.390380	15	HT. Lead Casing	2	N.380250	33	Union	1
N.390290	16	HT. Lead (Plug)	6	N.380340	34	Oil Feed Pipe complete	1
N.390300	17	HT. Lead (Coil)	1	N.380180	35	Distance Piece	1
N.390400	18	Identification Tab (HT. Lead) No.1.	1	FB.105/15D	36	Bolt, 5/16" BSF	2
N.390410	-	Identification Tab (HT. Lead) No.2.	1	N.380240	37	Washer, 5/16" dia.	1
N.390420	-	Identification Tab (HT. Lead) No.3.	1	N.380070	38	Spring	1
N.390430	-	Identification Tab (HT. Lead) No.4.	1	N.380060	39	Shoulder Screw	1
N.390440	-	Identification Tab (HT. Lead) No.5.	1	N.390360	40	Starter Pinion - Lucas 291069	1
N.390450	-	Identification Tab (HT. Lead) No.6.	1	N.390710	41	Starter - Lucas Model M.35G/1 Type WG.3 (Less Solenoid)	1
N.390890	19	Coil - Lucas 45054D	1				
N.380780	20	Distributor - Lucas 40489A	1	N.390700	42	Solenoid - Lucas ST.950 (Attached to Bulkhead)	1
N.390840	21	Spark Plug Adaptor Unit with Suppressor	6				



Engine Electrical Group

General Data

Distributor Drive Casing Assembly

Clearance of shaft in casing.	.0003 to .0013 inch (.008 to .03 m/m)
Shaft end float.	.002 to .004 inch (.05 to 0.1 m/m)
Clearance of Rev. Counter Drive Shaft in bush.	.0004 to .0016 inch (.01 to .04 m/m)
Rev. Counter drive shaft end float.	.005 to .014 inch (.13 to .35 m/m)

Engine Electrical System

System.	12 volt with constant voltage control.
Battery.	51 ampere/hours. Lucas GTW/9A.
Dynamo.	Lucas C39. PV-2.
Coil.	Lucas HA. 12
Starter.	Lucas M35G/1. Type WG3.
Distributor.	Lucas. Model DX6A Ref.40489A. Advance Curve ECM.617.
Contact Breaker Gap.	.014 to .016 inch. (0.35 to 0.4 m/m).
Sparking Plug.	KLG.P.Ten L.70 (Long Reach).
Sparking Plug Gap.	.018 to .020 inch (.46 to .51 m/m)

Distributor Drive Casing Assembly Removing

Remove the distributor cover and disconnect the L.T. lead.

Disconnect the manual control and remove the shouldered screw securing the clamp plate to the casing and lift out the distributor body complete with the clamp plate.

Disconnect the hose clips to the air cleaner, disconnect the revolution drive cable and also the oil pipe feed. Loosen the pipe at its lower connection and swing it clear.

Remove the two bolts attaching the drive casing to the cylinder head taking care to retain the selective distance piece. These two bolts will also release the air cleaner and the manual ignition control bracket.

Remove the two nuts and spring washers from the lower attachment flange and lift out the casing unit.

Dismantling and Re-assembling the Distributor Drive Casing Assembly

Unscrew the revolution drive body and withdraw the revolution counter drive shaft. see Fig.46.

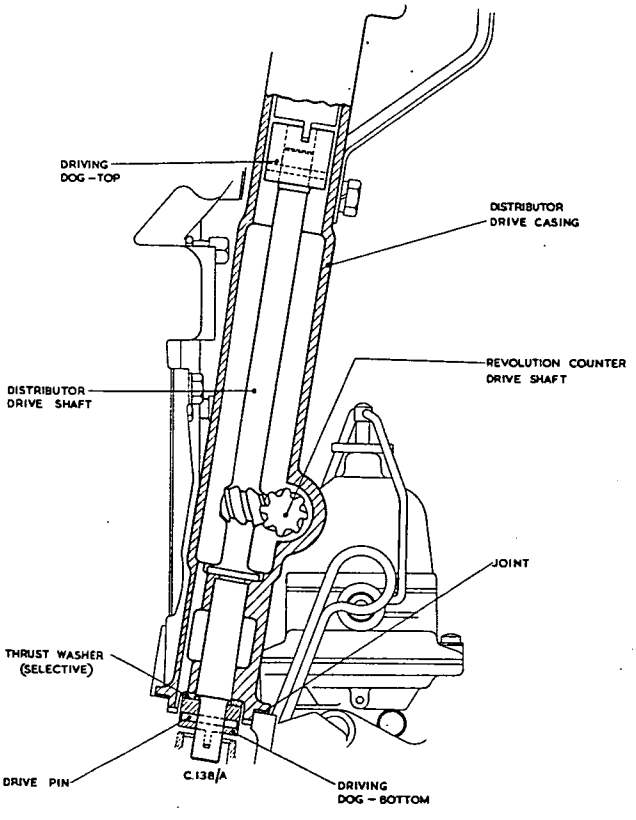


Fig. 46. Dismantling and re-assembling the distributor drive casing assembly

Punch out the driving pin securing the bottom driving dog and remove the driving dog and the selective thrust washer.

Withdraw the shaft from the casing and if necessary punch out the driving pin securing the top driving dog.

Rebuild the assembly, with any new parts which may be required, by reversing the foregoing procedure. Check that the end float is with the figures given in General Data and if necessary fit a selective thrust washer available in four thicknesses. See Spares list.

Fit a new washer to the revolution drive body.

When the assembly is completed refit to the engine by fitting a new joint to the lower flange face. Insert the lower end of the casing assembly into its location, turning the shaft until the tongue and slot location is aligned. Fit the nuts and spring washer but do not tighten.

Fit the top two bolts through the air cleaner bracket, manual control bracket the casing and its selective distance piece and lightly tighten.

Tighten the lower flange nuts and finally tighten the upper bolts.

Connect the revolution drive cable and the oil feed pipe.

Fit the distributor turning the rotor to engage with the top driving dog. The slot of the driving dog and the tongue of the distributor are offset from the centre and will only engage correctly one way.

Fit the shouldered bolt and its washer through the slot of the clamp plate and tighten.

Connect the L.T. lead. Check and set the ignition timing and fit the distributor cover.

Note. The lower driving dog is not offset, it can therefore be fitted 180° out of its correct setting. If this should have occured remove the H.T. leads from the cover and reposition them in their correct 'firing' sequence.

Ignition Timing (Initial Setting)

All Engines fitted to Type 404 Car.

All Engines fitted to the Type 405 up to Chassis 4066.

The above engines have no provision to indicate Top Dead Centre which can only be determined from the actual piston by removing a sparking plug.

On Chassis 405/4067 the flywheel is clearly marked at 10° before T.D.C. and at T.D.C.

These markings can be positioned using a central marking on an aperture which is located on the top right hand side of the clutch housing and is covered by a swing cover.

On engine without marking obtain the 5° before Top Dead Centre as follows:

Remove the front (No.1) Sparking Plug and turn the engine over with the starting handle until No.1 piston is rising on the compression stroke. This is readily obtained by counting five compressions and then turning steadily on the sixth phrase.

Insert a clean rod, not less than 9 inches in length, and obtain the top dead centre position. This should be suitable for intial setting.

On engines with markings on the flywheel a halfway distance between the 10° before T.D.C. and T.D.C. should be sighted which will give a fairly accurate 5° before T.D.C.

When the above settings are determined set the distributor clamping plate hard against the shouldered screw so that the elongation is in its fully retarded position.

Slacken, the clamp screw of the distributor and rotate the distributor until the contacts are just breaking. Tighten the clamp screw.

Now swing the distributor body forward to the full extent of the elongation in the clamp plate which will then give the engine starting position and the manual control position.

To obtain the final ignition setting.

Start the engine.

When the normal running temperatures are reached open up to say 2,000 rpm using the hand throttle control.

With the manual control in the fully advanced position loosen the clamp bolt and turn the distributor body until maximum r.p.m. are obtained at that throttle opening.

Tighten the clamp bolt.

Distributor Contact Breaker

The contacts are available as a set to Lucas Part No. 407050

To recondition the points or to replace the set first remove the distributor cover and lift of the rotor. Release the nut and disconnect the H.T. lead at the side of the distributor body. Slacken the locknut 'A' in Fig. 47 to release the slotted end of the rocker spring 'C' lift off the rocker arm from its pivot post, and take off the insulating washer. Remove the screws 'B' and washers and lift off the fixed contact plate.

To dress the contacts use a fine grade carborundum stone but take care to keep the faces as flat as possible as shown in Fig.48 When all traces of 'pitting' have been removed clean off thoroughly.

To fit the contact set refit the contact plate and secure lightly with the washers and screws. Fit the insulating washer over the rocker post, lightly oil the rocker post, fit the rocker and secure its spring by attaching the slotted end to the terminal and tightening the locknut. Attach the L.T. lead.

To Set the Points

Turn the crankshaft with the starting handle until the

rocker is on the peak of one of the distributor cam lobes. Slacken the two screws 'B' sufficient to be able to move it and adjust it Fig. 49 until the feeler gauge .014 to .016 inch is a good sliding fit between the points. Tighten the screws turn the starting handle a few turns to locate on another cam lobe and finally check the gap. Lightly lubricate the cam then refit the rotor and cover.

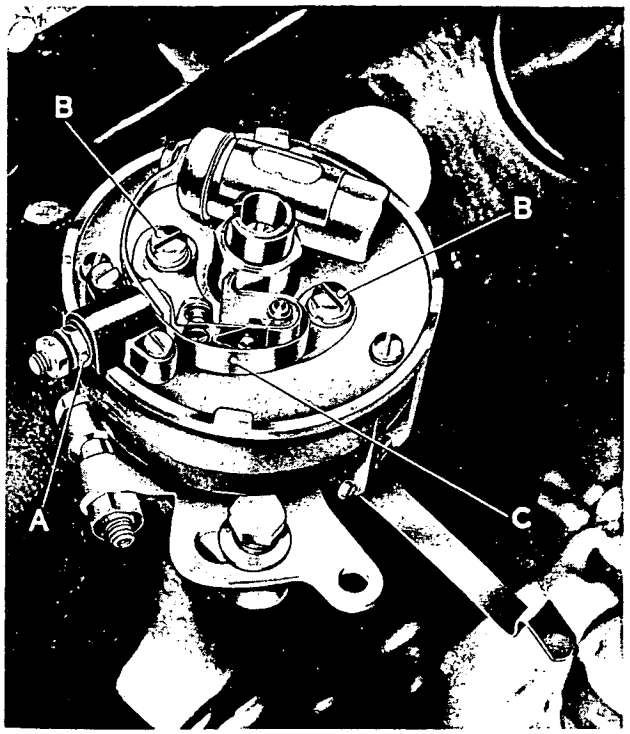


Fig. 47. Contact breaker details

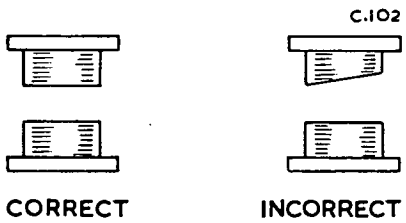


Fig. 48. Contact faces

Distributor Cover and Rotor

At the same time as cleaning and setting the points it is advisable to clean the rotor and the segments in the distributor cover. With the rotor removed scrape the contact face with a knife. Do not use emery cloth to clean the rotor or distributor cap segment.

Clean the six segment studs in a similar manner and thoroughly clean the inside of the cover. Make sure that the central carbon contact is free in its location. To lubricate the distributor shaft apply three or four drops of lubricating oil around the exposed screw head.

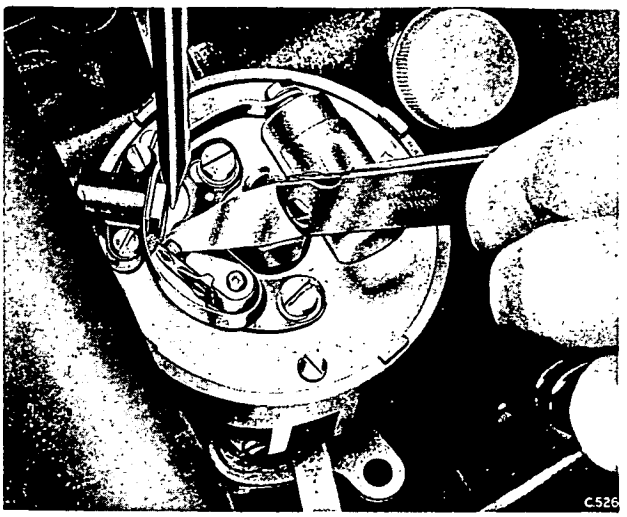


Fig. 49. Setting contacts

Checking the Ignition System

A systematic check of the ignition system can be made as follows:

Disconnect each H.T. wire in turn from its sparking plug, and position the end of the cable about 1/4" inch away from any bare metal part of the engine. With the ignition switched on turn the engine, if a spark occurs the defect is in the sparking plug. If no spark occurs proceed to check as follows;

Disconnect the centre lead (i.e. coil to distributor from the distributor. With the distributor cover removed turn the engine with the handle to close the contacts. Position the disconnected end of the centre lead about 1/4 inch away from same bare metal part of the engine and switch on the ignition. Manually open and close the contact breaker points when a spark should occur at the end of the lead on opening the points. No electric shock will be felt at the contact breaker since it is in the L.T. circuit (12 volts).

If no spark occurs check that the L.T. and H.T. connections to the coil are secure and clean. Then repeat the check. If no spark occurs a defective coil is indicated.

To check this disconnect the L.T. lead (SW) on the coil, to eliminate the ignition switch circuit, then connect the SW direct to the negative terminal of the battery with a separate insulated wire. Recheck the opening and closing of the contacts and if no spark occurs a faulty coil is confirmed. If a spark does occur then the fault would be between the coil and the ignition switch. Disconnect the temporary wire from the battery.

If on checking for spark a strong discharge is noted between the points as they open, it indicates a faulty condenser, but it is unlikely that a condenser will fail completely and suddenly.

Replacing Condenser

The condenser part is Lucas 407044.

Lift off the distributor cover and the rotor and dis-

connect the connecting strip at the head of the condenser.

Remove the screw and shakeproof washer from the clip which will release the condenser.

Clean off and fit the replacement.

Sparking Plugs

A special long reach universal joint spanner Part No. N.600011 should be used to fit or remove the 10 m/m sparking plugs. The spanner has a rubber insert which grips the top of the plug for lifting out. When removing and refitting plugs always use this spanner and its tommy bar N.600130. Do not screw in the plug too tightly, finger pressure on the tommy bar is sufficient.

The plugs should be serviced at least every 3,000 miles and the gaps reset. When it is no longer possible, due to the wear of the electrodes, to adjust the gap the plugs should be replaced.

The K.L.G. Plugs are of the detachable type and can be dismantled for cleaning purposes. Alternatively, the plugs may be cleaned by the use of proper sand-blasting equipment. Care should be taken to see that all abrasive is cleaned from inside the plug, this is most readily done by dismantling the plug.

To take the plug to pieces refer to Fig.50

The Gland nut (B) should be unscrewed from the body (D) so that the insulated electrode assembly (A) may be withdrawn. This operation is best carried out by using two box spanners which fit the respective hexagons without slackness. Grip the box spanner for the gland nut in the vice while the other box spanner is used to unscrew the body.

If the insulation is oily, wash in petrol or paraffin, then with fairly coarse glass paper remove the carbon deposit and wash again. The firing point (F) should be cleaned with fine emery cloth.

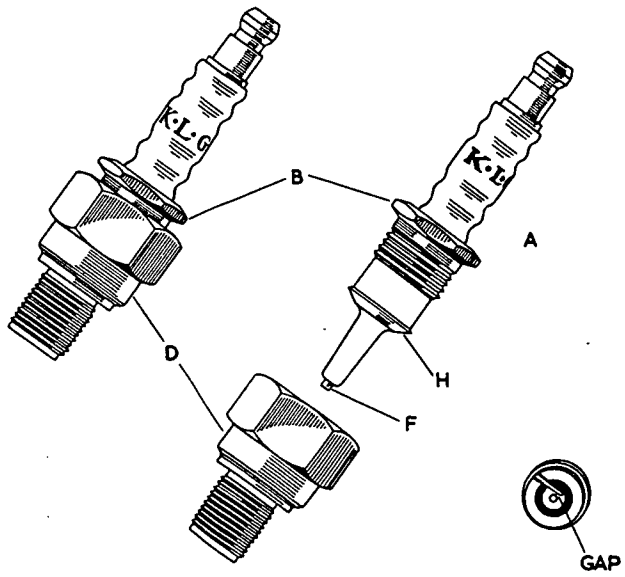


Fig. 50. Sparking plug dismantling

The plug body (D) should be scraped clean internally with a knife or wire brush, paying particular attention to the earth electrode, and finally washed off in petrol.

The internal washer (H) should be lightly smeared with thin oil. Make sure that it is properly seated in the plug body before inserting the central electrode assembly. Screw in the gland nut and tighten sufficiently to give a gas-tight joint.

Finally adjust the gap to .018 to .020 inch carefully moving the earth electrode only to obtain this figure with a feeler gauge.

Gearbox and Overdrive

List of Contents

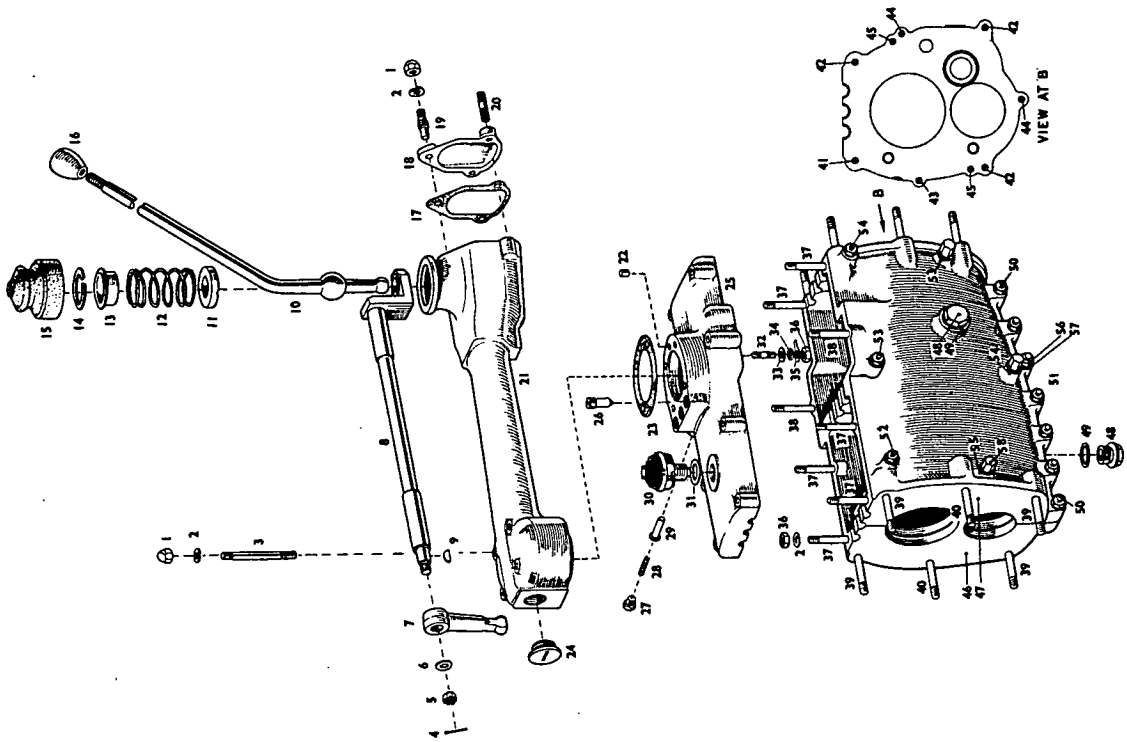
List of Contents

Gearbox and Overdrive

TYPE 404. REMOTE CONTROL GEARBOX COVER AND CASING.

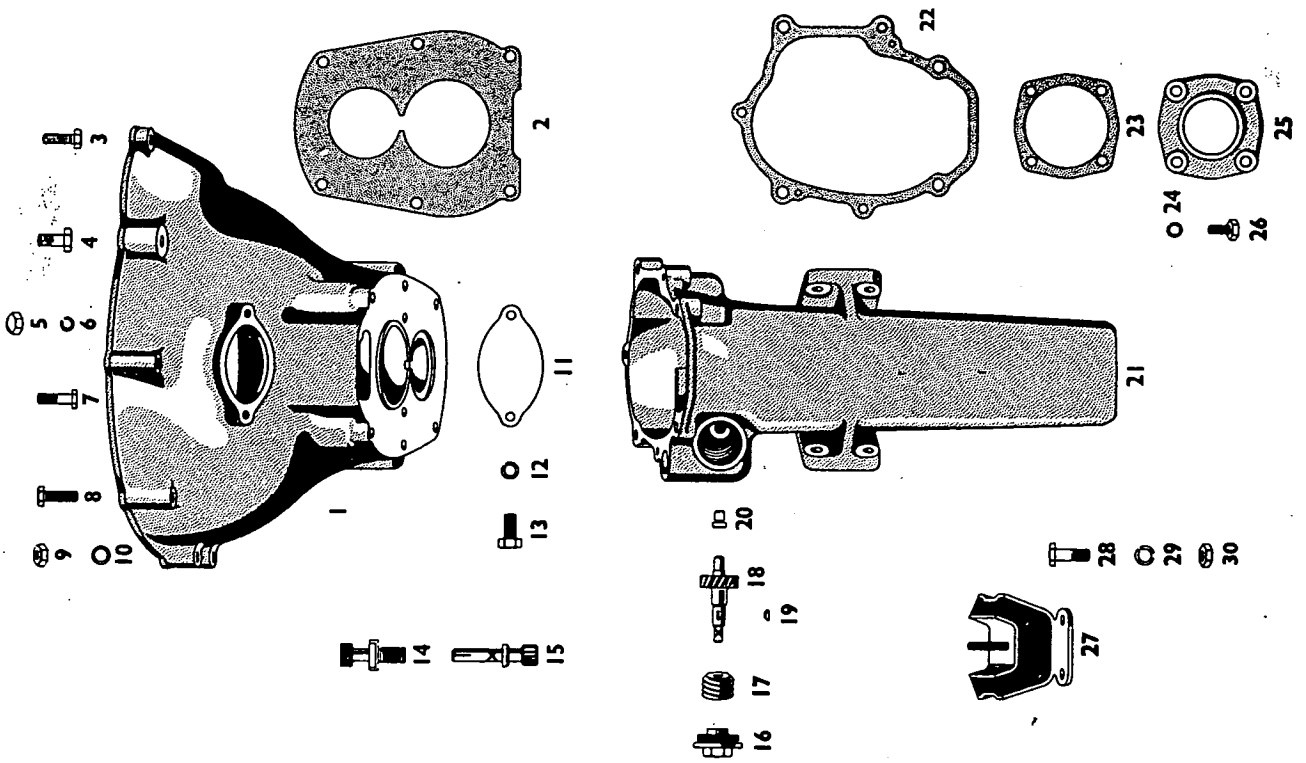
Part No.	Item	Description	No. off per car
N.454250	1	Dome Nut	7
AGS.585/D	2	¼" dia. Spring Washer	18
N.454540	3	Stud	4
-	4	Split Pin 1/16" dia. ¾" long	1
FN.405/L	5	5/16" BSF. Slotted Nut	1
-	6	5/16" Plain Washer	1
N.454510	7	Selector Finger	1
N.455120	8	Rocking Shaft Unit	1
N.454770	9	Key	1
N.454560	10	Gear Change Lever	1
N.454460	11	Bearing Cup	1
N.454570	12	Spring	1
N.454450	13	Retaining Plate	1
N.453880	14	Circlip	1
N.455110	15	Dust Excluder	1
N.704118	16	Gear Lever Knob	1
N.454070	17	Paper Washer	1
N.453920	18	Cover Plate	1
N.454620	19	Stud - Gear Lever Location	1
N.454030	20	Stud - Turret Cover	2
N.454530	21	Remote Gear Change Turret	1
N.453990	22	Dowel	1
N.454550	23	Joint Washer	1
N.454520	24	Plug	1
N.455390	25	Gearbox Cover)All 404 Cars	1
N.450470	26	Selector Ball Unit)Type 405 Cars	2
N.452750	-	Selector Ball Unit - Reverse) up to Chassis (Marked 'R')) 4136	1
N.455550	-	Gearbox Cover)Type 405 Cars	1
N.455560	-	Selector Ball Unit) Used on and	2
N.455570	-	Selector Ball Unit - Reverse) from Chassis (Marked 'R')) 4137	1
N.450660	27	Setscrew - Reverse Plunger	1
N.452270	28	Spring - Reverse Plunger	1

Part No.	Item	Description	No. off per car
N.450650	29	Reverse Plunger	1
N.451880	30	Oil Filler Plug) Type 404	1
FBS.520	31	Washer) Cars	1
N.452550	-	Overdrive Contact Switch -) Type 405 Lucas 515500-45) Cars	1
N.454440	-	Shim Washer)	as reqd.
N.453120	32	Stud	2
N.450600	33	Distance Washer - Selector Plate	2
N.450570	34	Distance Tube - Selector Plate	2
N.450590	35	Tabwasher	2
FN.104/L	36	Nut ¼" BSF	2
N.453090	37	Stud - Short - Gearbox Cover	6
N.453080	38	Stud - Long - Gearbox Cover	2
N.455340	39	Stud - Long - Clutch Casing	4
N.455360	40	Stud - Short - Clutch Casing	2
N.455370	41	Stud - Short - Extension Bracket	1
N.455350	42	Stud - Long - Extension Bracket	3
N.455380	43	Stud - Short - Extension Bracket	1
N.455260	44	Stud - Long - Extension Bracket	2
FBS.379/DS	45	Dowel	2
N.452730	46	Gearbox Casing - Offside) Paired	1
N.452740	47	Gearbox Casing - Nearside) Paired	1
N.452540	48	Plug	2
FBS.517	49	Washer	2
N.453110	50	Locating Bolt	2
FB.105/16D	51	Bolt	5
FB.105/43D	52	Bolt	1
FB.105/49D	53	Bolt	2
FB.105/41D	54	Bolt	2
FB.105/45D	55	Bolt	1
FN.105/L	56	Nut 5/16" BSF	20
AGS.585/E	57	Spring Washer	20
N.451080	58	Domed Nut	3
N.455710	-	Washer - to be used with the Domed Nut	3



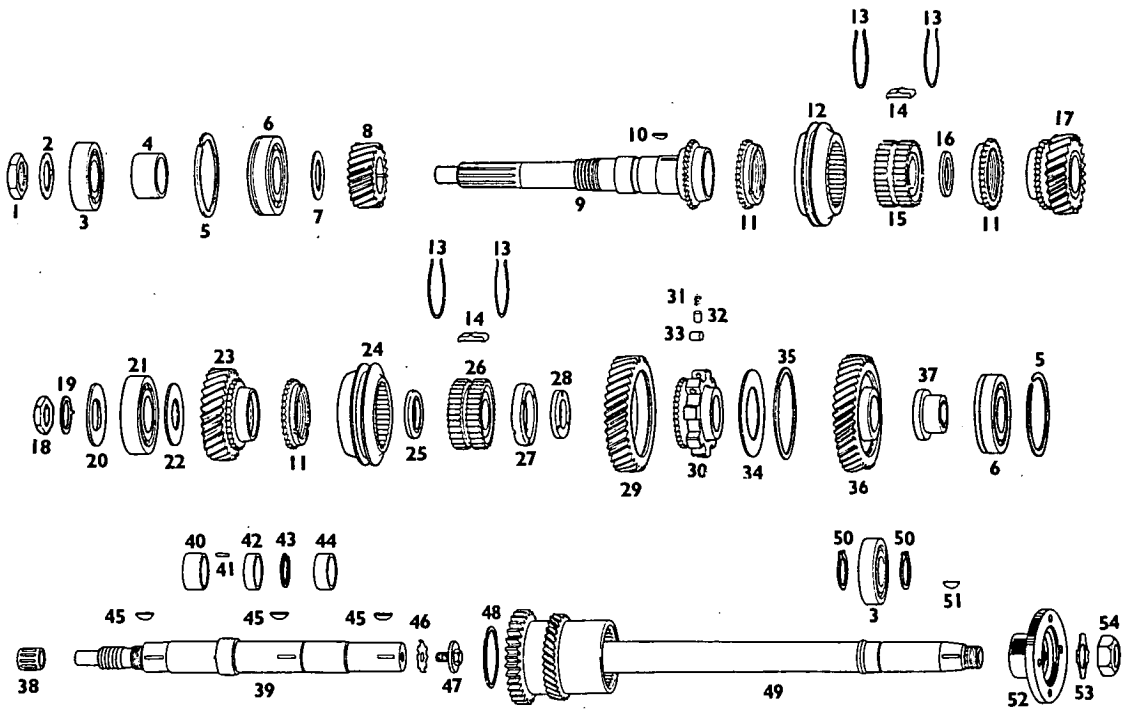
TYPE 404. CLUTCH CASING. GEARBOX EXTENSION AND SPEEDOMETER DRIVE.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.452760	1	Clutch Casing	1	N.451890	16	Cover (Speedo 1st Redn. Shaft)	1
N.450010	2	Joint Washer (Gear Box Front)	1	N.454230	17	Worm	1
WS.105/10D	3	Setscrew 5/16" BSW	1	N.451350	18	Gear (Speedo 1st Redn. Driven)	1
WB.106/22D	4	Bolt 3/8" BSW	2	N.452600	19	Key	1
WN.105/L	5	Nut 5/16" BSW	4	N.450400	20	Thrust Pad (Speedo Drive)	2
AGS.585/E	6	Spring Washer 5/16"	8	N.451170	21	Gear Box Extension Unit	1
WB.105/21D	7	Bolt 5/16" BSW	4	N.451190	22	Joint Washer (Gear Box Rear)	1
WS.105/17D	8	Setscrew 5/16" BSW	3	N.450960	23	Joint Washer (End Plate)	1
WN.106/L	9	Nut 3/8" BSW (Starter)	2	AGS.585/D	24	Spring Washer	4
AGS.585/F	10	Spring Washer 3/8" (Starter)	2	N.450890	25	End Plate	1
N.451750	11	Inspection Port Cover	1	FS.104/7D	26	Setscrew ¼" BSF	4
AGS.585/D	12	Spring Washer	2	N.311290	27	Rear Mounting Block	2
WS.105/3D	13	Setscrew ¼" BSW	2	FB.105/8D	28	Bolt 5/16" BSF	4
N.451010	14	Union (Speedo Drive)	1	AGS.585/E	29	Spring Washer 5/16"	8
N.454240	15	Gear (Speedo 2nd Redn. Driven)	1	FN.105/L	30	Nut 5/16"	8



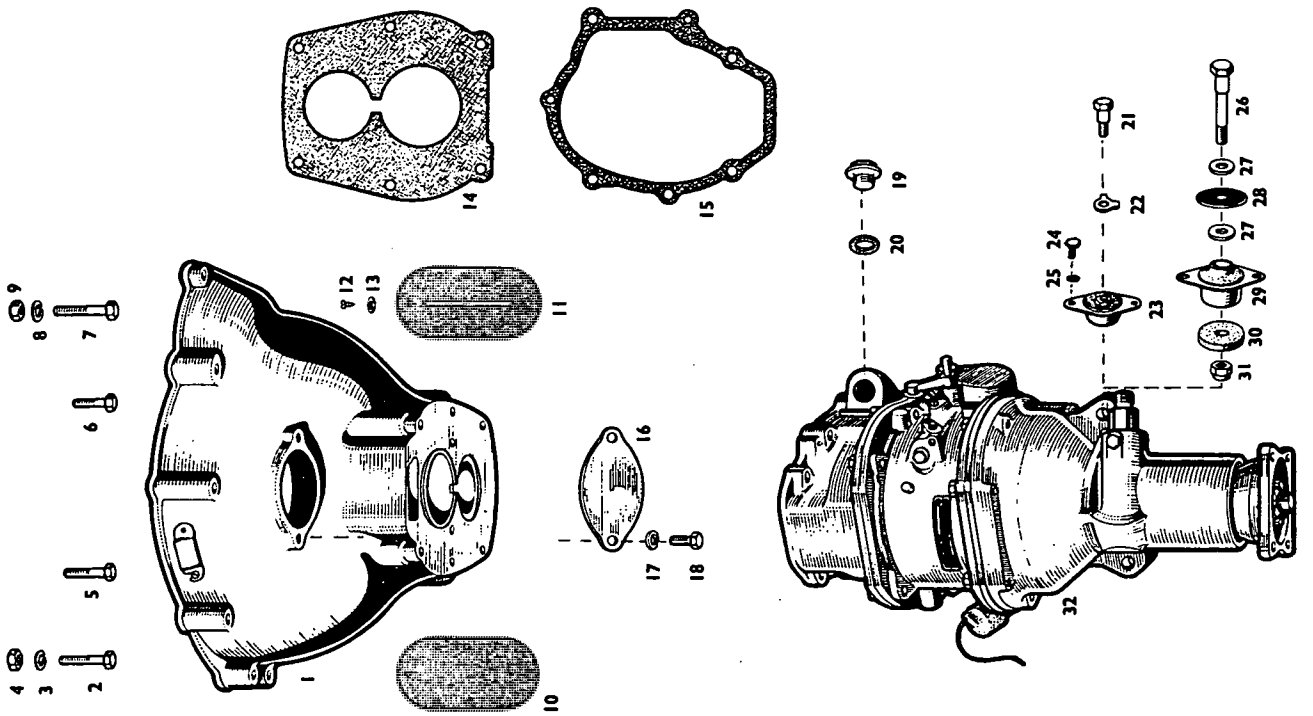
TYPE 404. MAINSHAFT - GEARBOX.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.453660	1	Bearing Retaining Nut	1	N.453800-4	-	Thrust Washer .210 thick	-
N.450810	2	Tabwasher - Drive Shaft	1	N.453800-5	-	Thrust Washer .205 thick	-
N.452390	3	Bearing - Front Drive Shaft	2	N.453800-6	-	Thrust Washer .200 thick	-
N.453670	4	Distance Piece - Drive Shaft	1	N.453800-7	-	Thrust Washer .195 thick	-
N.452720	5	Circlip	1	N.453800-8	-	Thrust Washer .190 thick	-
N.451550	6	Bearing - Drive Shaft	2	N.453800-9	-	Thrust Washer .185 thick	-
N.453650	7	Distance Washer - Drive Shaft	1	N.453800-10	-	Thrust Washer .180 thick	-
N.453440	8	Gear	1	N.453800-11	-	Thrust Washer .175 thick	-
N.453680	9	Drive Shaft	1	N.453540	23	Hub Free 2nd Gear	1
N.453210	10	Woodruff Key	1	N.453550	24	Sliding Hub - 1st and 2nd	1
N.455500	11	Synchroniser Blocker Ring	3	N.452840	25	Thrust Washer	1
N.453610	12	Sliding Hub 3rd and 4th	1	N.453590	26	Hub Fixed 1st and 2nd	1
N.453020	13	Retaining Ring	4	N.452900	27	Distance Washer	1
N.453030	14	Shifting Plate	6	N.452890	28	Thrust Washer	1
N.453600	15	Hub Fixed 3rd and 4th	1	N.452820	29	Gear - Freewheel Mainshaft 1st	1
N.453810-7	16	Thrust Washer .100 thick	1	N.452870	30	Free Wheel Hub - Mainshaft 1st	1
N.453810-8	-	Thrust Washer .080 thick	-	N.450630	31	Spring - Freewheel	8
N.453570	17	Hub Free 3rd Gear	1	N.451260	32	Plunger - Freewheel	8
N.450930	18	Locknut - Mainshaft Front	1	N.451300	33	Roller - Freewheel	8
N.450920	19	Tabwasher	1	N.451230	34	Roller Retaining Plate	1
-	20	Thrust Washer - Front - Centre Mainshaft Bearing	2	N.451250	35	Retaining Ring	1
				N.453710	36	Freewheel Assembly	1
N.453800-7	-	Thrust Washer .195 thick	-	N.451830	37	Bush - Bearing Location	1
N.453800-8	-	Thrust Washer .190 thick	-	N.450520	38	Needle Roller Bearing	1
N.453800-9	-	Thrust Washer .185 thick	-	N.453000	39	Main Driving Shaft Unit	1
N.453800-10	-	Thrust Washer .180 thick	-	N.453360	40	Distance Piece	1
N.453800-11	-	Thrust Washer .175 thick	-	N.452410	41	Needle Roller	240
N.453800-12	-	Thrust Washer .170 thick	-	N.453380	42	Distance Piece	1
N.453800-13	-	Thrust Washer .165 thick	-	N.451910	43	Circlip - Mainshaft	1
N.453800-14	-	Thrust Washer .160 thick	-	N.453370	44	Distance Piece	1
N.453800-15	-	Thrust Washer .155 thick	-	N.453220	45	Woodruff Key	3
N.453800-16	-	Thrust Washer .150 thick	-	N.451730	46	Tabwasher	1
N.453800-17	-	Thrust Washer .145 thick	-	N.450790	47	Nut Retaining Mainshaft	1
N.453800-18	-	Thrust Washer .140 thick	-	N.451180	48	Retaining Ring	1
N.452420	21	Bearing - Centre Main Shaft	1	N.450330/ SEL/A1	49	Hub, Reverse, & Speedo Unit Selective Assembly	1
-	22	Thrust Washer - Rear - Centre Mainshaft Bearing	2	N.452620	50	Bearing Retaining Ring	2
N.453800-1	-	Thrust Washer .225 thick	-	N.480021	51	Key	1
N.453800-2	-	Thrust Washer .220 thick	-	N.704112	52	Companion Flange	1
N.453800-3	-	Thrust Washer .215 thick	-	N.451600	53	Tabwasher	1
				N.451610	54	Nut - Coupling Retaining	1



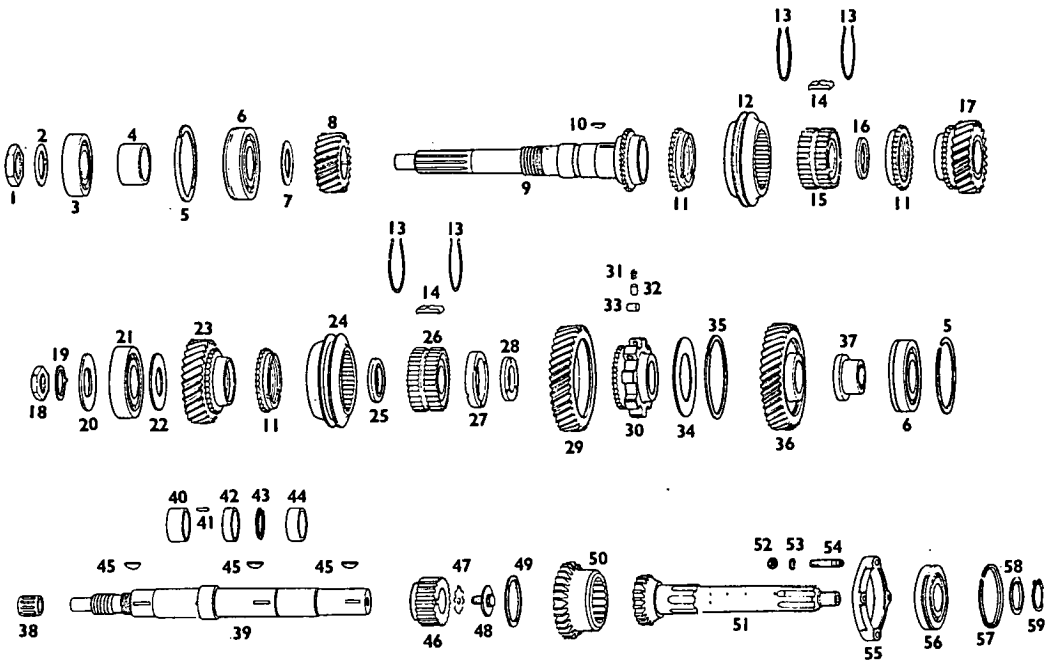
TYPE 405. CLUTCH CASING AND OVERDRIVE UNIT

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.455630	1	Clutch Casing Unit	1	AGS.585/D	17	Spring Washer ¼" dia.	2
WB.105/21D	2	Bolt 5/16" Whit. 2.5/8" long	4	WS.104/3D	18	Setscrew ¼" Whit. 3/8" long	2
AGS.585/E	3	Spring Washer 5/16" dia.	8	N.451880	19	Filler Plug	1
WN.105/L	4	Nut 5/16" Whit.	4	FBS.520	20	Washer - Filler Plug	1
WB.105/17D	5	Bolt 5/16" Whit. 2.1/8" long	3	N.455170	21	Bolt - Rear Engine Mounting) Used on	2
WB.105/10D	6	Bolt 5/16" Whit. 1¼" long	1	N.455240	22	Tabwasher) Chassis	2
WB.106/22D	7	Bolt 3/8" Whit. 2¾" long	2	N.455160	23	Metalastik Metacone Mounting) 4001 to 4184	2
AGS.585/F	8	Spring Washer 3/8" dia.	2	405-1-20158	24	Setscrew	4
WN.106/L	9	Nut 3/8" Whit	2	-	25	5/16" Shakeproof Washer	4
N.441000	10	Gaiter	1	N.455660	26	Bolt) Used on	2
N.440990	11	Gaiter - Operating Lever	1	-	27	¼" dia. Plain Washer)	2
-	12	No.6 P.K. Screw Type Z Rd. Hd. 5/16" long	16	N.455670	28	Oil Shield)	2
-	13	4 B.A. Plain Copper Washer	16	N.455690	29	Rear Engine Mounting) Chassis 4185	2
N.450010	14	Joint - Gearbox - Front	1	N.455700	30	Rebound Washer)	2
N.451190	15	Joint - Gearbox - Rear	1	-	31	7/16" B.S.F. Philidas Nut) Onwards	2
N.461750	16	Inspection Port Cover	1	N.454400	32	Overdrive Unit complete	1



TYPE 405. MAINSHAFT - GEARBOX.

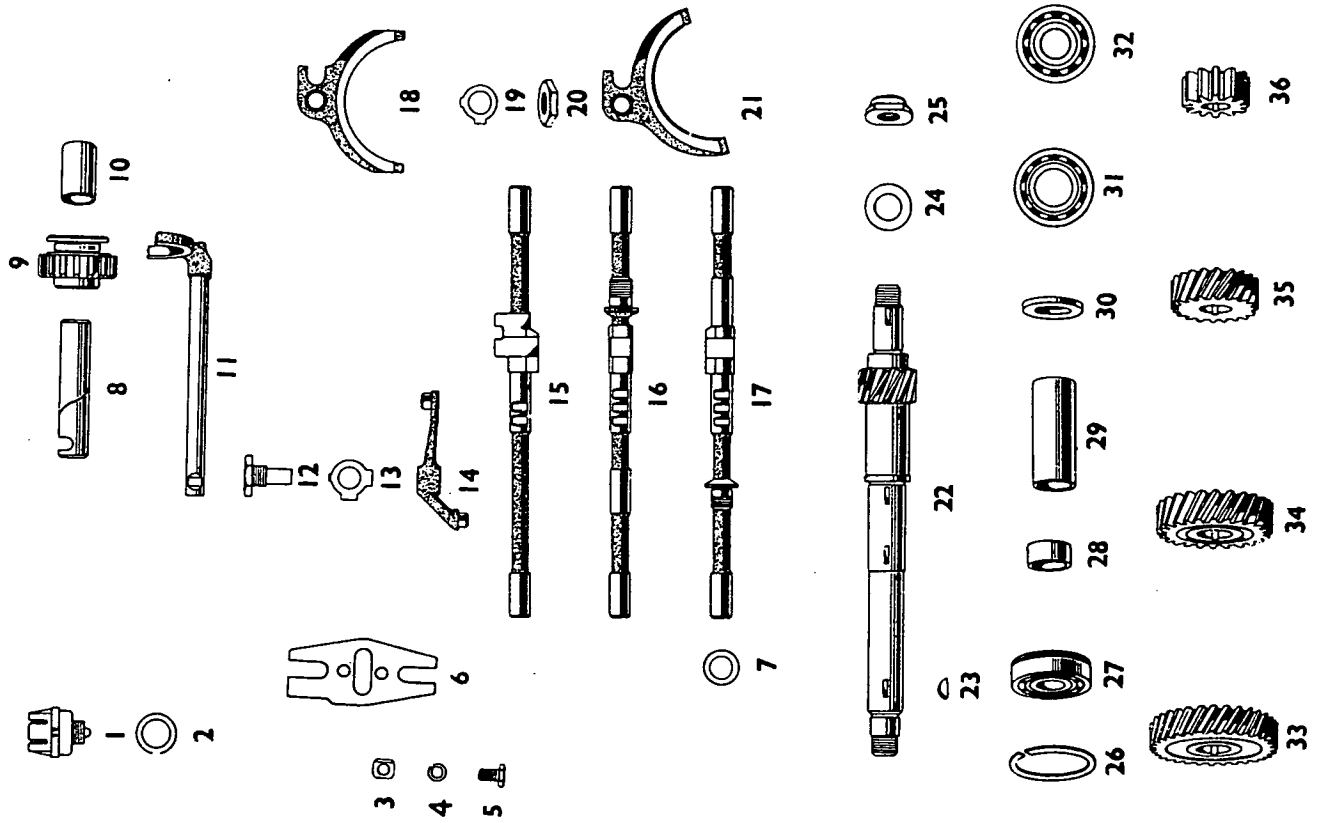
Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.453660	1	Bearing Retaining Nut	1	N.453800-8	-	Thrust Washer .190 thickness	-
N.450810	2	Tabwasher - Drive Shaft	1	N.453800-9	-	Thrust Washer .185 thickness	-
N.452390	3	Bearing - Front Drive Shaft	1	N.453800-10	-	Thrust Washer .180 thickness	-
N.453670	4	Distance Piece - Drive Shaft	1	N.453800-11	-	Thrust Washer .175 thickness	-
N.452720	5	Circlip	2	N.453540	23	Hub - Free - 2nd. Gear	1
N.451550	6	Bearing - Driveshaft & Mainshaft	2	N.453550	24	Sliding Hub - 1st and 2nd	1
N.453650	7	Distance Washer - Drive Shaft	as reqd	N.452840	25	Thrust Washer	1
N.453440	8	Gear - Drive Shaft	1	N.453590	26	Hub - Fixed 1st and 2nd.	1
N.453680	9	Drive Shaft	1	N.452900	27	Distance Washer	1
N.453210	10	Woodruff Key	1	N.452890	28	Thrust Washer	1
N.455500	11	Synchroniser Blocker Ring	3	N.452820	29	Gear - Freewheel - Mainshaft 1st.	1
N.453610	12	Sliding Hub 3rd and 4th	1	N.452870	30	Freewheel Hub - Mainshaft 1st.	1
N.453020	13	Retaining Ring	4	N.450630	31	Spring - Freewheel	8
N.453030	14	Shifting Plate	6	N.451260	32	Plunger - Freewheel	8
N.453600	15	Hub - Fixed 3rd and 4th	1	N.451300	33	Roller - Freewheel	8
N.453810-7	16	Thrust Washer .100 thickness	1	N.451230	34	Roller Retaining Plate	1
N.453810-8	-	Thrust Washer .080 thickness	-	N.451250	35	Retaining Ring	1
N.453570	17	Hub - Free 3rd.Gear	1	N.453710	36	Freewheel Assembly	1
N.450930	18	Locknut - Mainshaft - Front	1	N.451830	37	Bush - Bearing Location	1
N.450920	19	Tabwasher	1	N.450520	38	Needle Roller Bearing	1
-	20	Thrust Washer - Front - Centre Mainshaft Bearing	1	N.453000	39	Main Driving Shaft Unit	1
				N.453360	40	Distance Piece	1
N.453800-7	-	Thrust Washer .195 thickness	-	N.452410	41	Needle Roller	240
N.453800-8	-	Thrust Washer .190 thickness	-	N.453380	42	Distance Piece	1
N.453800-9	-	Thrust Washer .185 thickness	-	N.451910	43	Circlip - Mainshaft	1
N.453800-10	-	Thrust Washer .180 thickness	-	N.453370	44	Distance Piece	1
N.453800-11	-	Thrust Washer .175 thickness	-	N.453220	45	Woodruff Key	3
N 453800-12	-	Thrust Washer .170 thickness	-	N.450330	46	Hub	1
N.453800-13	-	Thrust Washer .165 thickness	-	N.451730	47	Tabwasher	1
N.453800-14	-	Thrust Washer .160 thickness	-	N.450790	48	Nut - Retaining - Mainshaft	1
N.453800-15	-	Thrust Washer .155 thickness	-	N.451180	49	Retaining Ring	1
N.453800-16	-	Thrust Washer .150 thickness	-	N.455040	50	Gear	1
N.453800-17	-	Thrust Washer .145 thickness	-	N.454120	51	Input Shaft	1
N.453800-18	-	Thrust Washer .140 thickness	-	FN.104/L	52	Nut ¼" BSF	4
N.452420	21	Bearing - Centre - Mainshaft	1	-	53	Washer ¼" Flat Spring	4
-	22	Thrust Washer - Rear - Centre Mainshaft Bearing	1	N.454410	54	Stud	4
				N.454080	55	Bearing Retainer	1
N.453800-1	-	Thrust Washer .225 thickness	-	N.454370	56	Ball Race	1
N.453800-2	-	Thrust Washer .220 thickness	-	N.454150	57	Circlip	1
N.453800-3	-	Thrust Washer .215 thickness	-	N.454130-1	58	Distance Piece .097 thickness	1
N.453800-4	-	Thrust Washer .210 thickness	-	N.454130-2	-	Distance Piece .101 thickness	-
N.453800-5	-	Thrust Washer .205 thickness	-	N.454130-3	-	Distance Piece .105 thickness	-
N.453800-6	-	Thrust Washer .200 thickness	-	N.454130-4	-	Distance Piece .109 thickness	-
N.453800-7	-	Thrust Washer .195 thickness	-	N.454090	59	Circlip	1



TYPE 405. SELECTOR SHAFT AND LAYSHAFT.

Part No.	Item	Description	No. off per car
Lucas 515500-45	1	Reverse Ligh Switch	1
N.452560	2	Washer - Reverse Light Switch	1
N.450580	3	Guide Block	2
AGS.585/D	4	Spring Washer	2
N.452780	5	Setscrew ¼" BSF	2
N.450560	6	Selector Plate. Used up to Chassis 4136	1
		Used up to Chassis 4136	
N.455520	-	Selector Plate	1
		Used on and from Chassis 4137	
N.452660	7	Distance Washer. Thickness .020" (Selector Fork)	as reqd
N.452670	-	Distance Washer. Thickness .030" (Selector Fork)	as reqd
N.452680	-	Distance Washer. Thickness .040" (Selector Fork)	as reqd
N.451000	8	Spindle (Reverse Gear Idler)	1
N.451160	9	Reverse Gear (Idler) with Bush	1
N.450750	10	Bush (Reverse Gear Idler)	1
N.450360	11	Fork Selector (Reverse)	1
N.450860	12	Pivot Pin	1
N.452060	13	Tabwasher	1
N.450430	14	Fulcrum Lever (Reverse)	1
N.450180	15	Selector Shaft (Reverse)	1
N.453630	16	Selector Shaft - Q 1st & 2nd.) All Type 404 Cars) Type 405 Cars up	1
N.453640	17	Selector Shaft - 3rd & 4th.) to Chassis 4136.)	1

Part No.	Item	Description	No. off per car
N.455610	-	Selector Shaft - 1st & 2nd.) Type 405 Cars) Used on and from	1
N.455510	-	Selector Shaft - 3rd & 4th.) Chassis 4137)	1
N.452380	18	Fork (Selector 1st and 2nd)	1
N.451720	19	Tabwasher	2
N.450670	20	Nut (Fork Retaining)	2
N.450530	21	Fork (Selector 3rd and 4th)	1
N.450301	22	Layshaft	1
N.453230	23	Key	4
N.450480	24	Tabwasher	2
N.450320	25	Nut	2
N.452710	26	Circlip	1
N.451530	27	Bearing (Front)	1
N.450690	28	Distance Piece (short)	1
N.450700	29	Distance Piece (long)	1
N.453740	30	Spacing Washer	2
N.453730	31	Roller Bearing - Centre	1
N.452440	32	Bearing - Rear	1
N.453430	33	Gear (Layshaft Driving)	1
N.453460	34	Gear (Layshaft 3rd)	1
N.450270	35	Gear (Layshaft 2nd)	1
N.450440	36	Gear (Reverse)	1



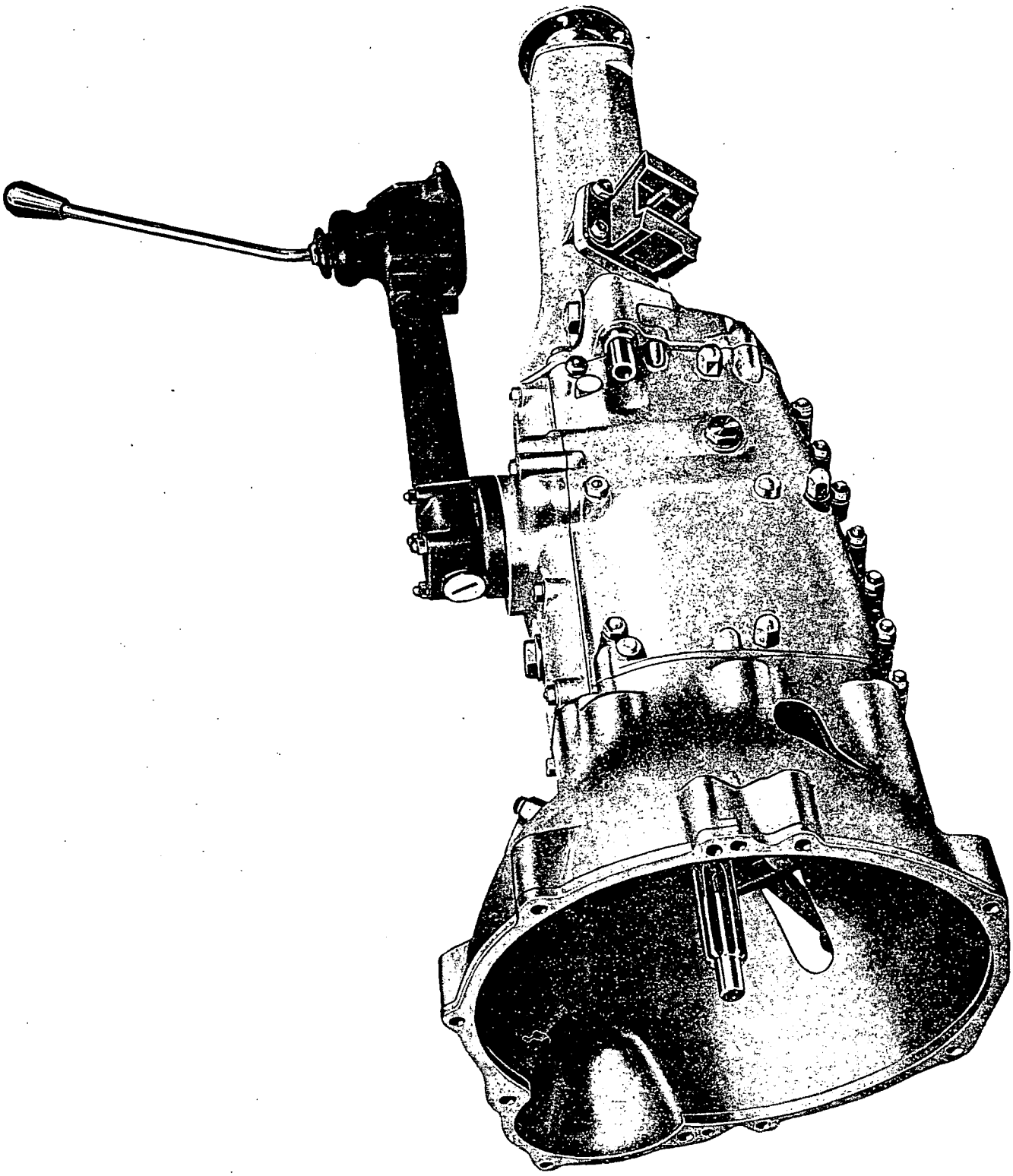


Fig. 51. Gearbox BWCR7

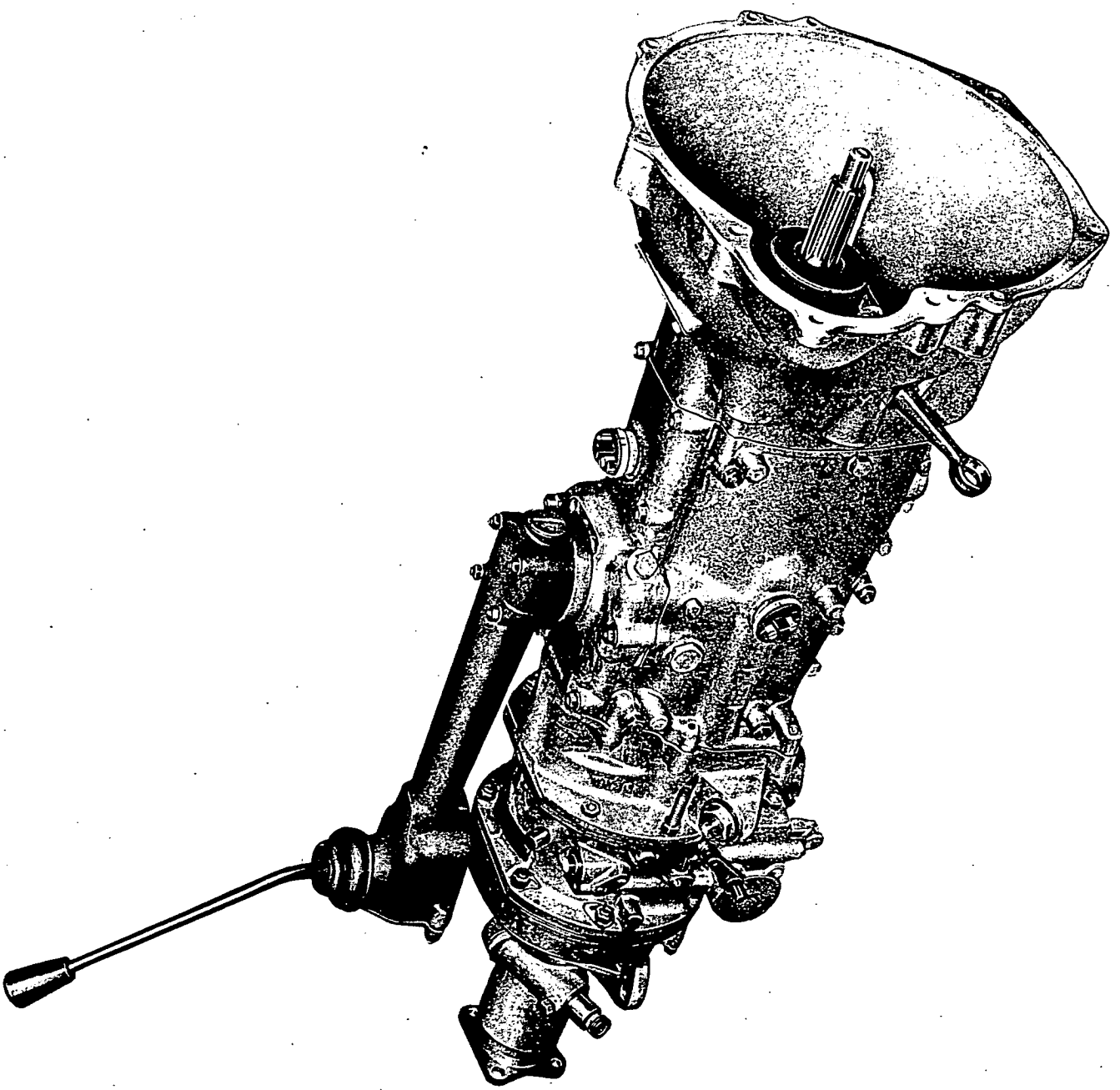
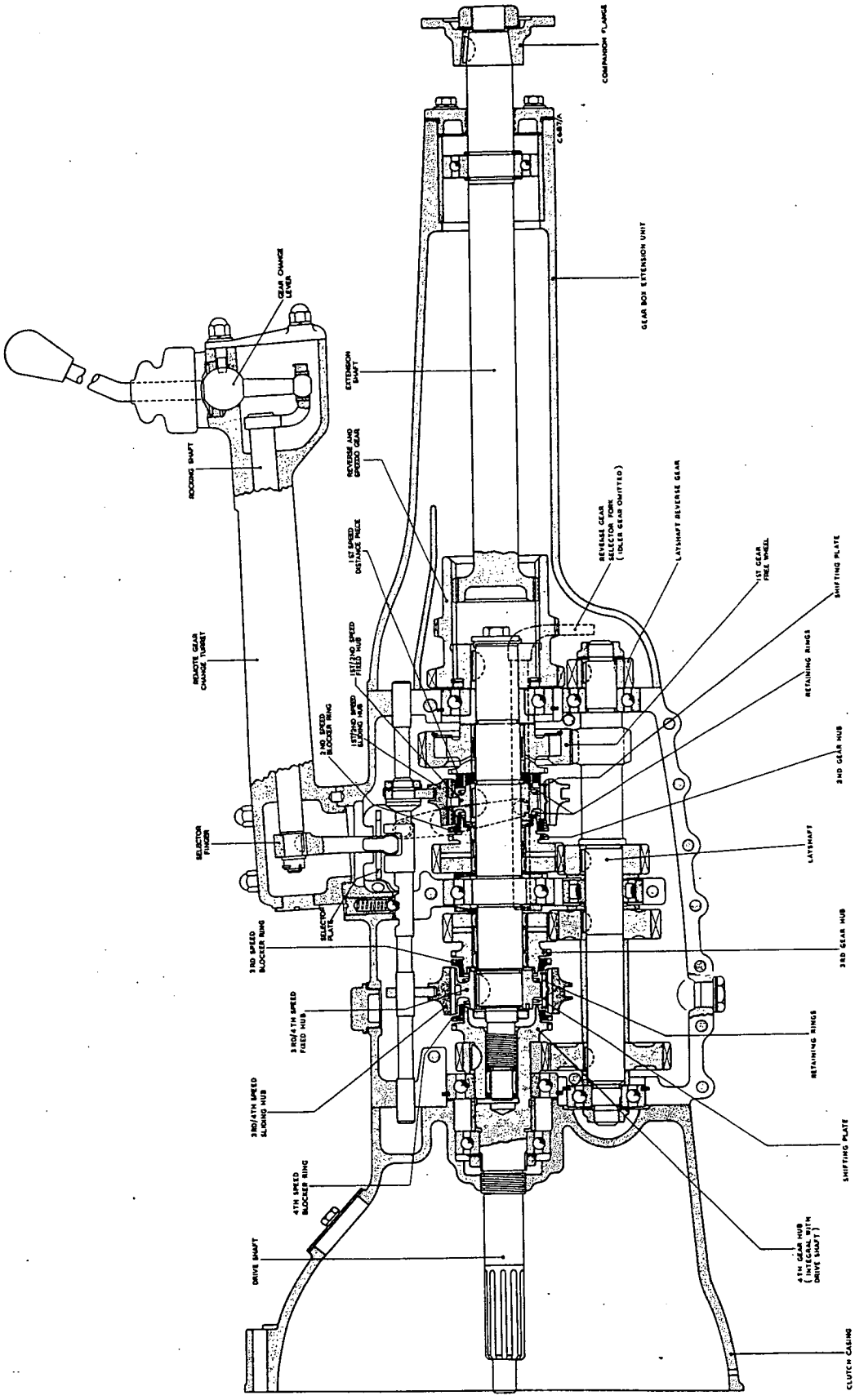
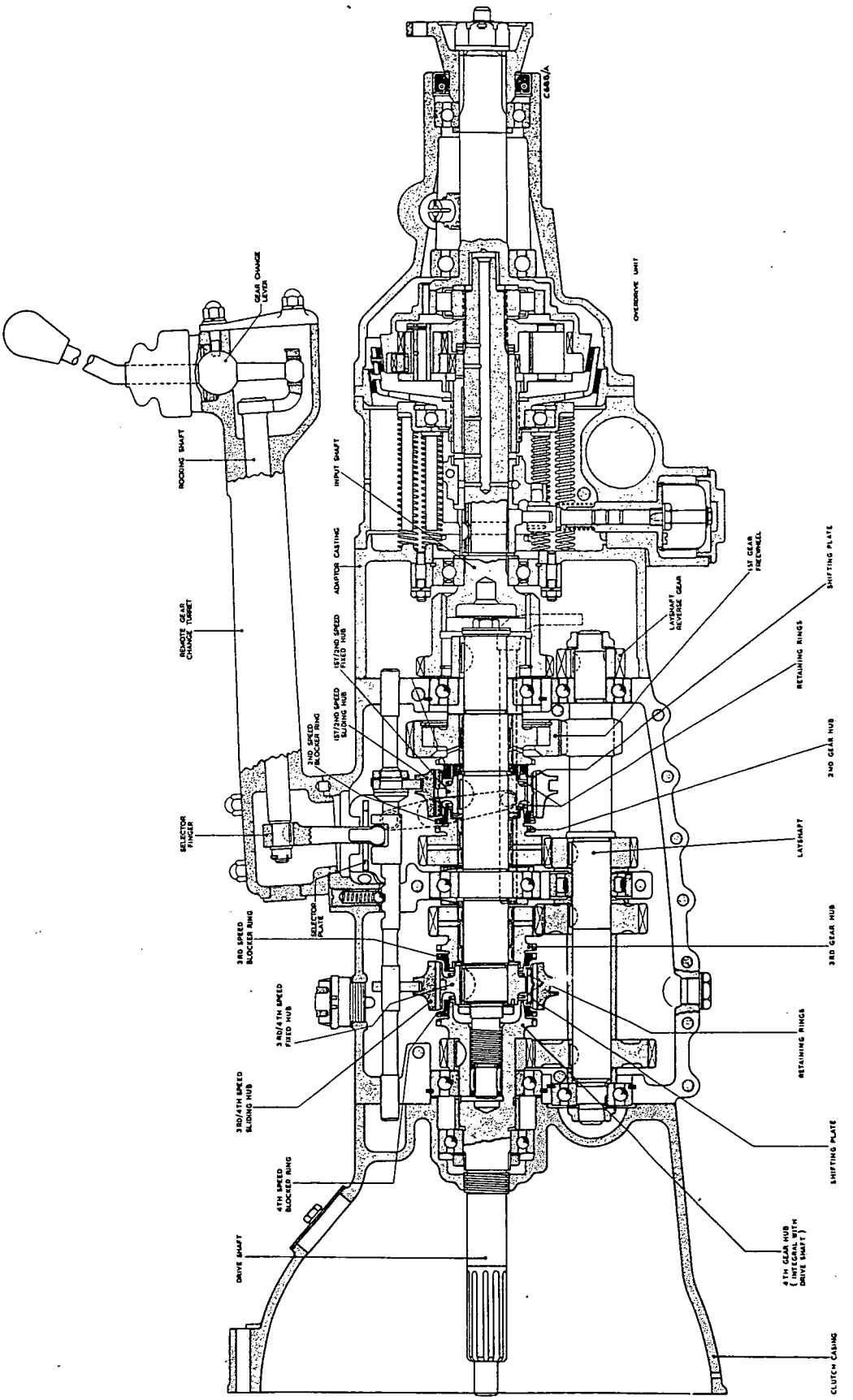


Fig. 52. Gearbox and overdrive BWCR11



Arrangement of gearbox without overdrive



Arrangement of gearbox with overdrive

Gearbox

Description

The gearbox fitted to the Type 404 Car is shown in Fig.51 and is stamped BW.CR7 followed by its serial number.

The gearbox and overdrive unit fitted to the Type 405 Car is shown in Fig.52 and is stamped BW.CR11 followed by its serial number.

Basically the gearbox portion forward of its rear face is identical in both cars but on Type 405 Cars the gearbox extension is replaced by an overdrive unit.

Type..... 'Bristol' with Borg-Warner Synchromesh, constant mesh helical gears.

Number of Speeds.....Four forward-one reverse. (Type 405 has Overdrive used in conjunction with Top Gear only).

Synchromesh in.....2nd., 3rd., and 4th. Gears.

1st. Gear..... Freewheel.

Replacements

Type 404.

A complete BW.CR7 gearbox is available as a re-conditioned exchange unit from the works.

Type 405 Car.

The gearbox portion only is available as a reconditioned exchange unit from the works.

The overdrive unit is a separate component, and is also available as an exchange reconditioned unit from the works.

In all instances exchange units are supplied subject to the return and inspection of the removed unit.

Removing the Gearbox from the Car

Drain the oil from the gearbox and refit the plug.

Remove the bonnet to enable the lifting sling to be used.

Remove the seats and floor covering.

Remove the clutch and brake pedal pads, slacken the accelerator pedal clamp screw and swing it clear of the toe-board.

Remove the four domed nuts attaching the remote control to the gearbox cover and lift this portion clear of the studs.

Remove the gearbox tunnelling, the floorboards and the toe-board.

Disconnect the speedometer flexible drive from the gearbox and the electrical connections to the reverse light switch (and overdrive switch).

Disconnect the companion flange at the rear of the gearbox or overdrive.

Fit the engine sling and take the weight of the engine. (see Removing the engine).

Remove the mountings securing the gearbox or overdrive to the chassis.

Remove the starter motor.

Supporting the gearbox, remove the remaining bolts securing the clutch casing to the engine.

Remove the bracket from the exhaust pipe clips and the clutch pull-off spring anchor bracket.

Withdraw the gearbox rearwards keeping it in line with the transmission to avoid damage to the clutch driven plate. When clear lift the gearbox from the car.

To Refit the Gearbox to the Car

Before refitting the gearbox, ensure that the joining faces are clean and undamaged and that the locating dowels are positioned correctly.

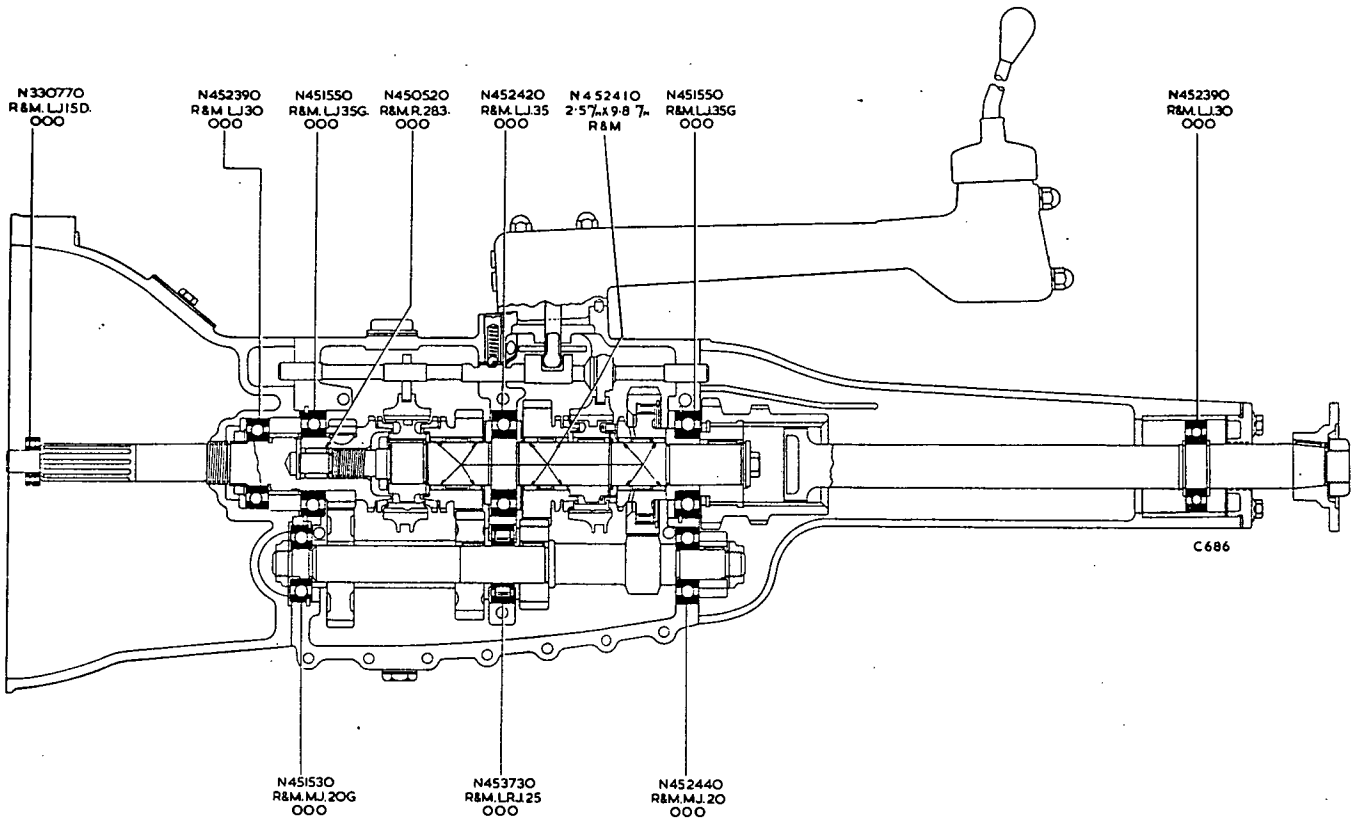
Reverse the operations of the removing procedure and finally refill with oil.

Servicing the Gearbox

The most common reasons for stripping the 'Bristol' Gearbox are, noisy races, dropping out of gear and the fracture of the 1st. (Freewheel) Gear.

To enable the ball races to be replaced without undue delay Fig.53 will indicate the bearings used in the gearbox fitted to the Type 404 Car and Fig.54 the bearings fitted in the gearbox and overdrive of the Type 405 Car.

Dropping out of gear, invariably 3rd. Gear, can be caused through insufficient or worn meshing of the dogs. It is not advisable to try to correct this by packing the



NOTE. N451550 DENOTES BRISTOL PART NUMBER

Fig. 53. Gearbox bearing diagram

selector forks or screwing in the selector ball units. New parts and the correct spacing by selective thrust washers is necessary. This is dealt with in detail.

The fracture of the 1st. Gear (Freewheel) can be caused by violent acceleration when in 1st. Gear causing the rollers in the freewheel to shoot out against the inner wall of the gear. Continuation of this will result in cracking the gear. When this is suspected the integral meshing gear of the layshaft should also be inspected.

Dismantling the Gearbox

Remove the clutch operating lever and its fulcrum bracket Fig.55 and release the six nuts securing the clutch housing to the front face of the gearbox.

Type 404 Cars.

Remove the nuts securing the gearbox extension to the rear face of the gearbox and withdraw the extension unit complete with its shaft.

Type 405 Cars.

Referring to Fig.56 detach the overdrive unit from the gearbox at Joint 'A'.

Proceed on both types as follows:

Remove the nuts securing the gearbox cover and lift off the cover.

Lift out the reverse selector shaft.

Remove the nuts and bolts securing the two halves of the casing and note where they are positioned as some act as close fitting locating bolts.

Separate the casing and lift out the selector shafts.

Remove the Layshaft assembly Fig.57.

Lift out the drive shaft and main driving shaft groups and withdraw the main driving shaft from the rear end of the drive shaft. Remove the needle roller race from either the front spigot of the main driving shaft or the recess in the drive shaft.

Dismantling the Layshaft Fig.58.

Release the tabwashers and remove the retaining nuts at each end of the shaft.

Referring to Fig.59 press the front bearing, short distance piece and gear from the shaft. Remove the key and remove the long distance piece.

Press off the 3rd. layshaft gear in a similar manner then remove the key and detach the front spacing washer.

Using the split bush TFN 8699 press the 2nd. layshaft gear, rear spacing washer and the centre bearing from the shaft as described for the layshaft driving gear, then

remove the key from the shaft.

Reverse the layshaft in the press and using the drift T178322 and the split bush T178321, press the shaft carefully until the rear bearing comes into contact with the key of the reverse gear. Now press the bearing back to its original position leaving a gap between the bearing and the reverse gear. Fit the split bush T188283 into the gap and press off the gear. Remove the key from the shaft and press off the rear bearing.

the remaining shifting plate retaining ring from the fixed hub.

Release the tabwasher and remove the special bolt from the rear end of the shaft, Fig. 62, then using the drift T178316, base T178317 and split bush T178318 withdraw the reverse gear and hub. Remove the key and locate the assembly in a press with the split bush T178315 beneath the front face of the 1st. gear then press off the 1st. gear and its hub and the bearing locating bush complete with the bearing.

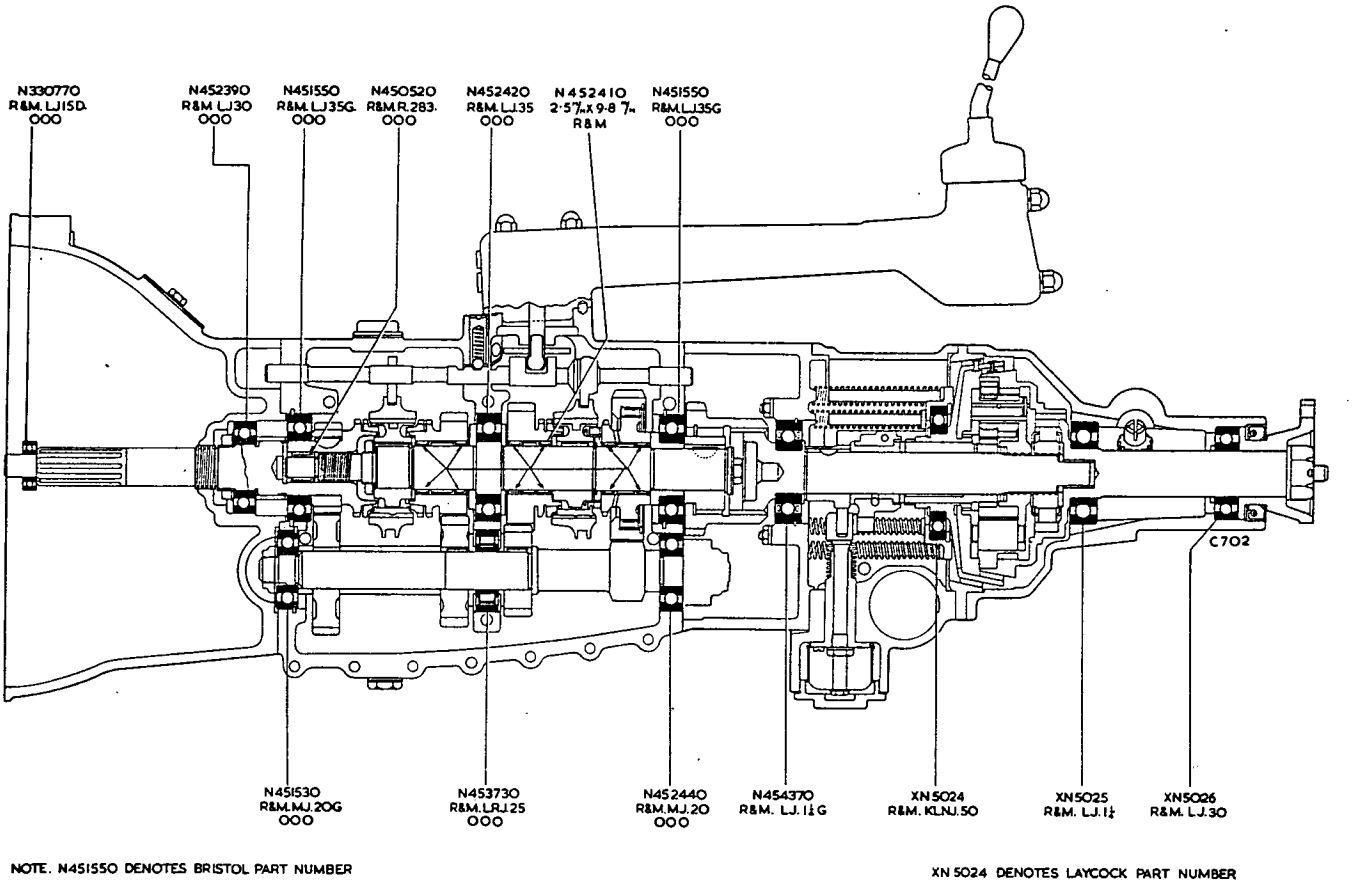


Fig. 54. Gearbox and overdrive bearing diagram

Dismantling the Main Driving Shaft Fig.60.

During the dismantling procedure, label the synchro mechanism and any thrust washers for position. This will considerably simplify re-assembly.

Lift out the 4th. speed blocker ring and withdraw the sliding hub. The three shifting plates will spring out as they are released. Remove the exposed retaining ring from the recess in the fixed hub.

Release the tabwasher at the forward end of the shaft and remove the locknut. Fig. 61

Locate the split bush TFN 8699 in the recess in the 3rd/4th fixed hub and press the hub from the shaft. Lift out the 3rd. speed blocker ring then remove the key. Make provision to catch the needle rollers and slide the 3rd. gear hub from the shaft followed by the distance piece and the centre bearing front thrust washer. Remove

Referring to Fig. 63 withdraw the 1st/2nd speed sliding hub; the three shifting plates will spring out as they are released.

Remove the retaining ring from the recess in the fixed hub.

Locating the split bush TFN 8699 in the recess of the hub, press the hub from the shaft. Lift out the 2nd. speed blocker ring then remove the fixed hub key. Taking precautions to prevent the loss of the needle rollers, slide the thrust washer and 2nd. gear hub from the shaft. Remove the needle roller distance piece and the centre bearing rear thrust washer.

Finally press the centre ball bearing off of the shaft.

Dismantling the Drive Shaft

Referring to Fig. 64 release the tabwasher and remove

the bearing retaining nut. Position the split bush TFN 8699 as shown in Fig. 65 and press off the front bearing, distance piece and rear bearing and the gear.

Should it be considered that removing the gear is unnecessary, remove the front bearing using split bush TFN 8699. Take off the distance piece and press off the rear bearing using the split bush T178320.

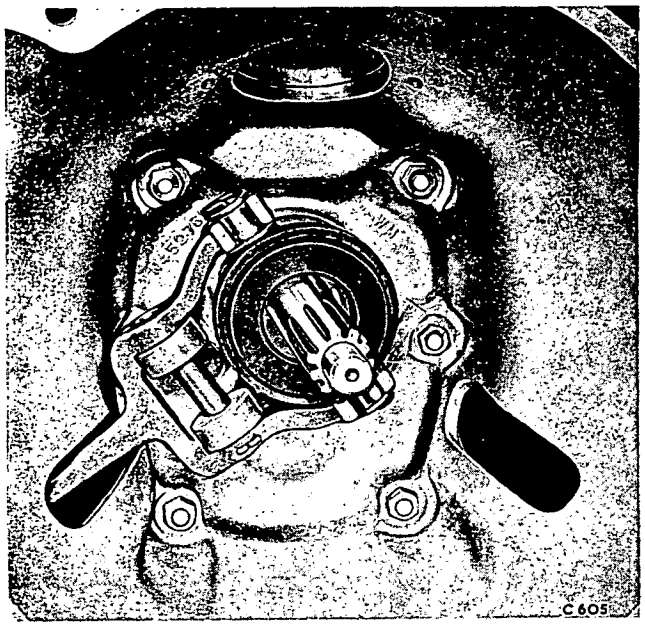


Fig. 55. Clutch casing and release mechanism

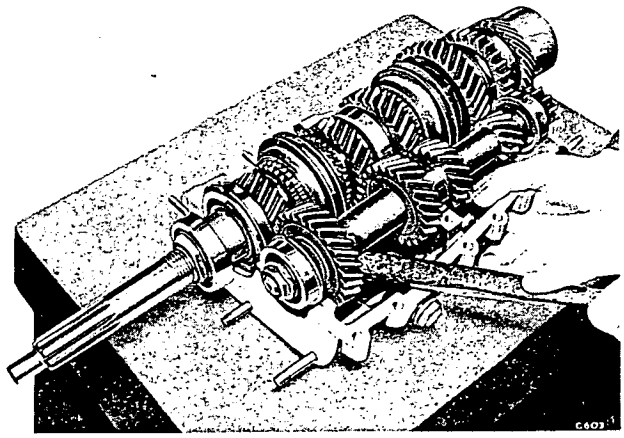


Fig. 57. Layshaft assembly

Dismantling the Freewheel

Referring to Fig. 66 remove the circlip and the retaining plate.

Ease out the freewheel mechanism until the rollers can be pushed down clear of the spring loaded plungers, then push the gear clear of the hub.

Reverse Selector Mechanism

Referring to Fig. 67 lift out the reverse fulcrum lever and, if necessary, release the tabwasher and unscrew the pivot pin bolt.

Unscrew and remove the reverse light switch. Slide out the reverse idler gear together with the fork selector.

Type 404 Cars.

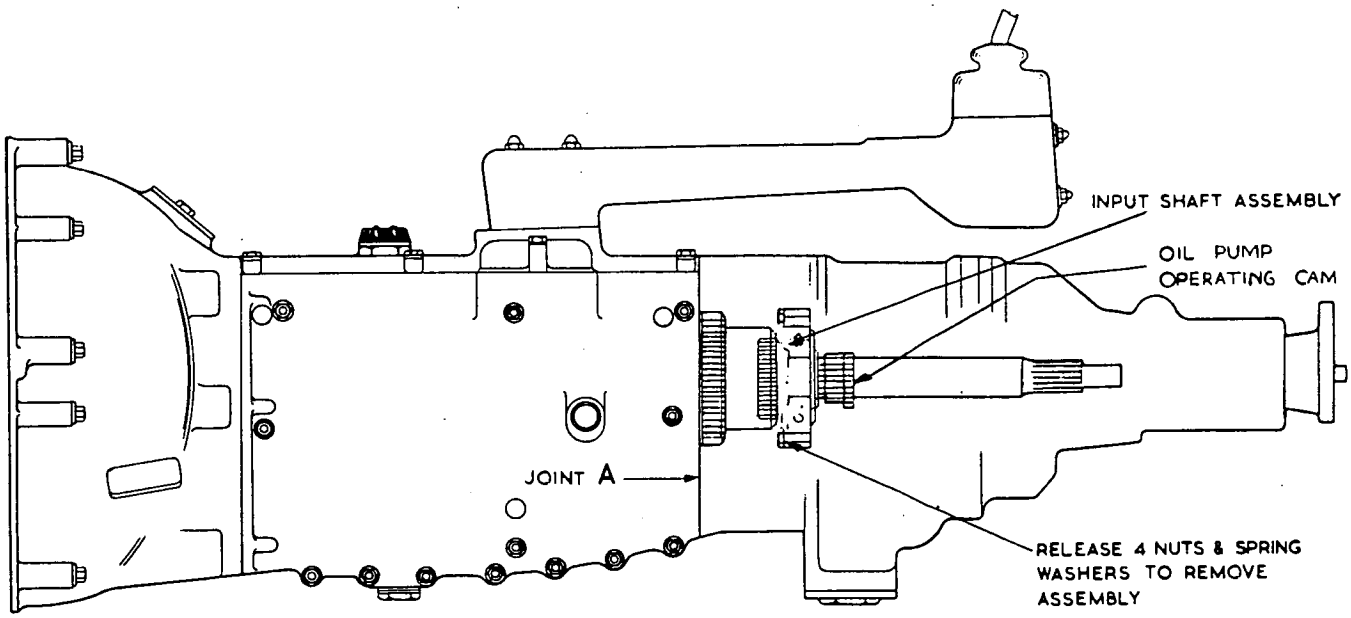


Fig. 56. Dismantling the overdrive unit from the gearbox

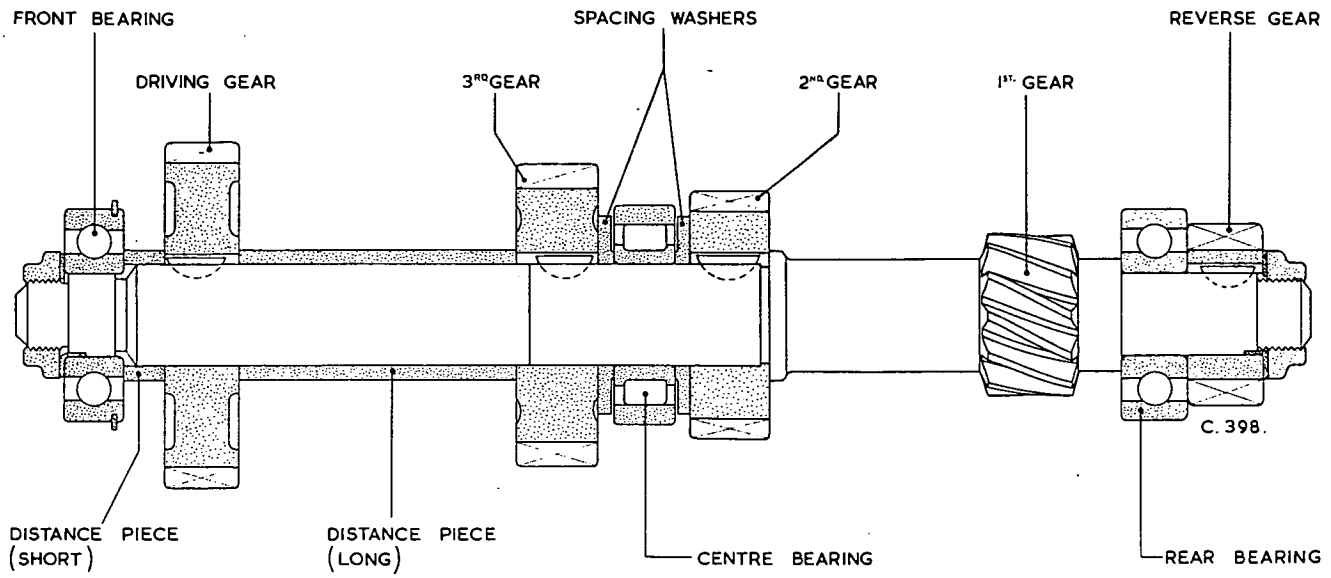


Fig. 58. General arrangement of layshaft

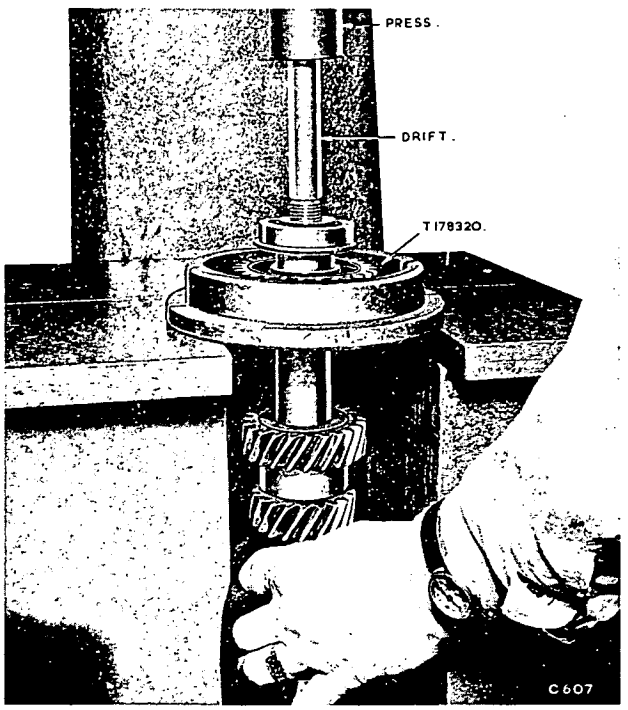


Fig. 59. Dismantling the layshaft

Dismantling the Gearbox Extension

Referring to Fig. 68 remove the screws securing the end-plate and withdraw the extension shaft from the casing.

Release the tabwasher, remove the nut and withdraw the companion flange from its taper on the shaft. Remove the bearing locating circlips and press the bearing from the shaft.

Unscrew the speedometer drive union from the front face of the casing and withdraw the 2nd. reduction speedometer driven gear.

Unscrew the cover and withdraw the 1st. reduction speedometer driven gear complete with the worm gear.

If necessary the worm gear can be pressed off.

Dismantling the Remote Control

Unscrew the gear lever knob. Remove the rubber dust excluder protecting the gear lever ball joint, followed by the circlip, spring retainer, spring and bearing cup, then lift out the gear lever.

Remove the dome nuts securing the cover plate and if necessary remove the special stud which provides location for the gear lever. This is screwed into the casting. See Fig.69.

Remove the plug from the other end of the casting and remove the split pin, nut and washer from the end of the rocking shaft and detach the selector finger located by its key. The rocking shaft can then be withdrawn.

Inspection of Parts Prior to Re-assembly

Carefully examine all components and check for wear on their essential locations. Pay particular attention to the mating splines of the fixed and sliding hubs and the dog teeth of the gear wheel hubs.

Excessive wear at these locations will result in accumulated and undesirable backlash.

Clean all bearings thoroughly in paraffin, spin by hand to test for running and if they are acceptable lubricate them lightly pending re-assembly. Renew bearings where harshness is noted or excessive wear.

The 2nd. and 3rd. gear wheels are a splined fit,

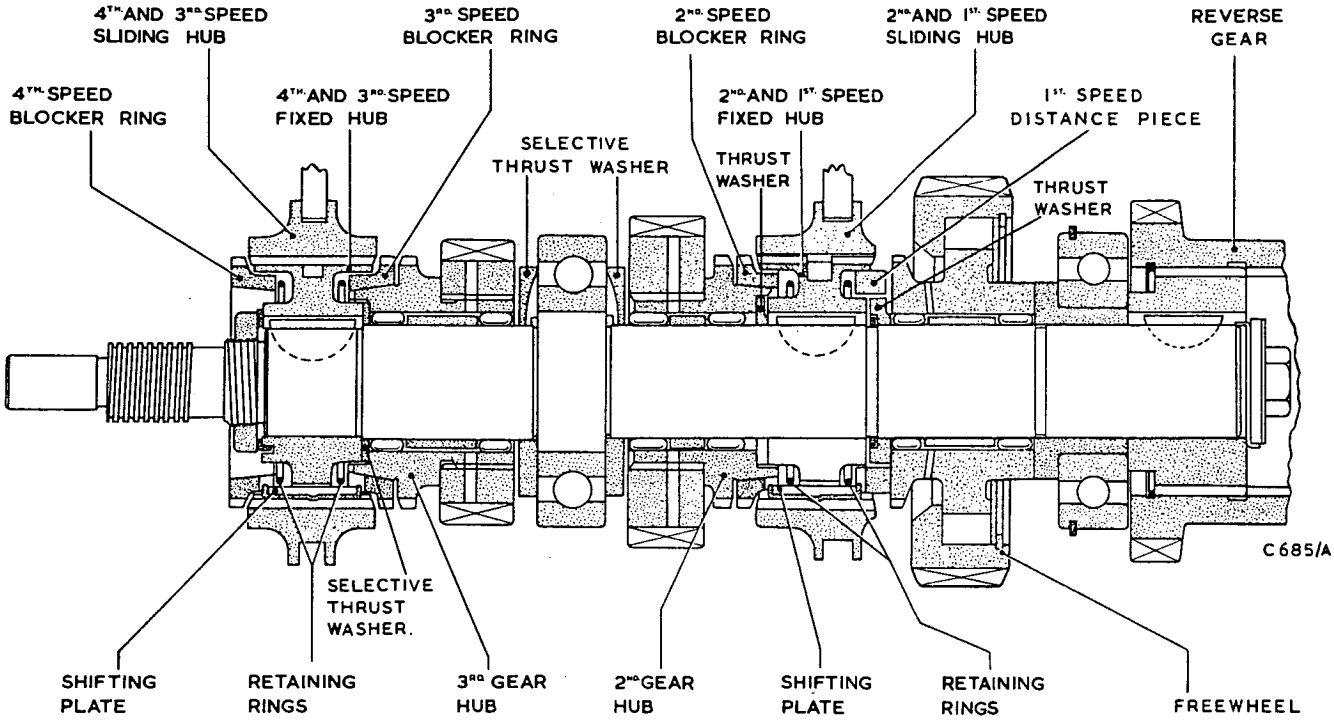


Fig. 60. General arrangement of main driving shaft

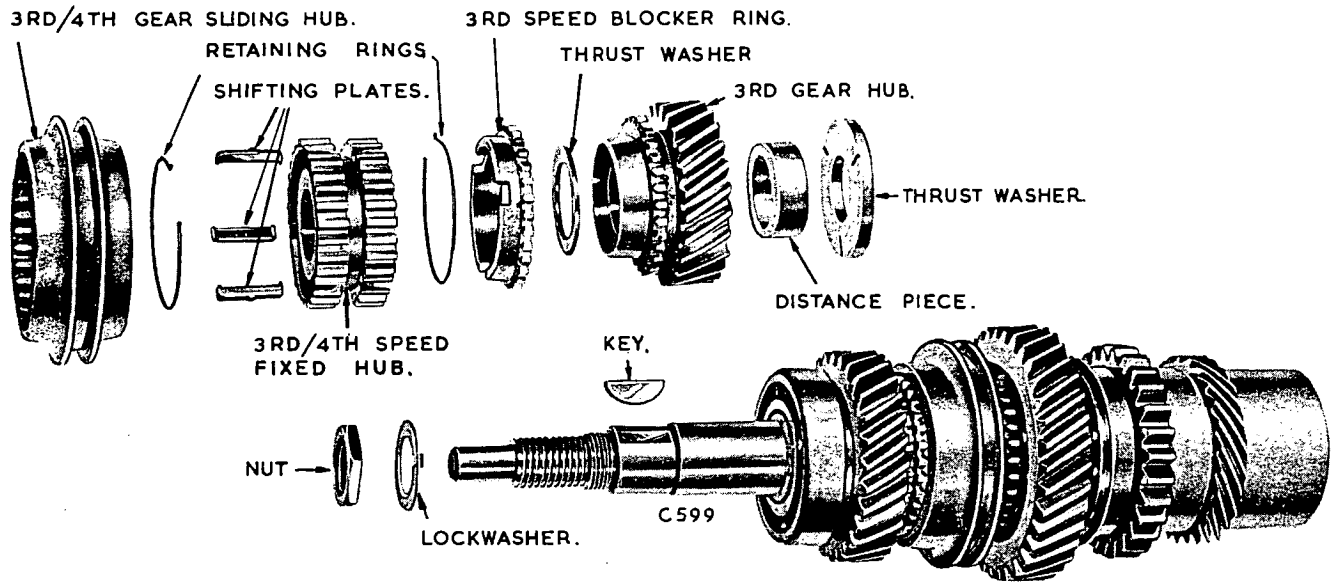


Fig. 61. Dismantling the main driving shaft Stage 1

finally peened to their respective hubs, no attempt should be made to separate them.

Check the freewheel gear for any signs of cracking using a magnaflux test where possible.

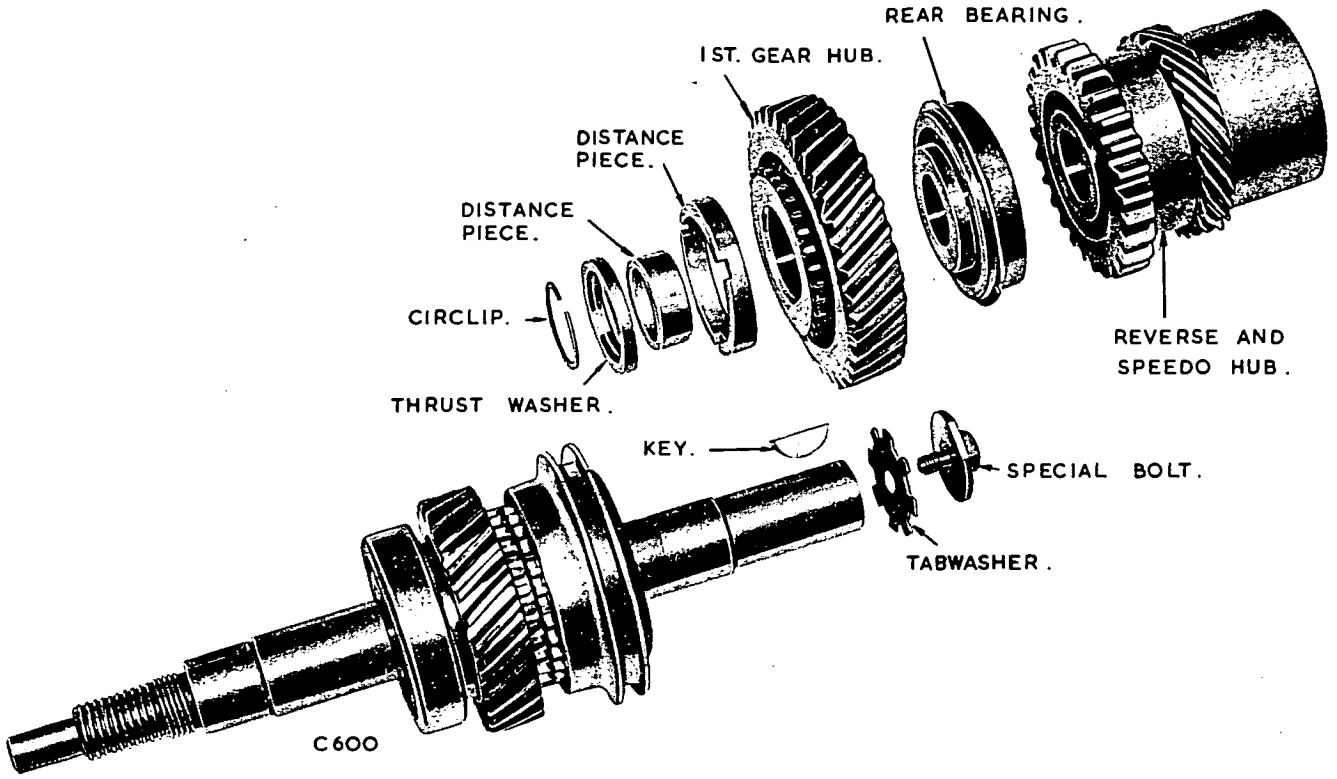


Fig. 62. Dismantling the main driving shaft Stage 2

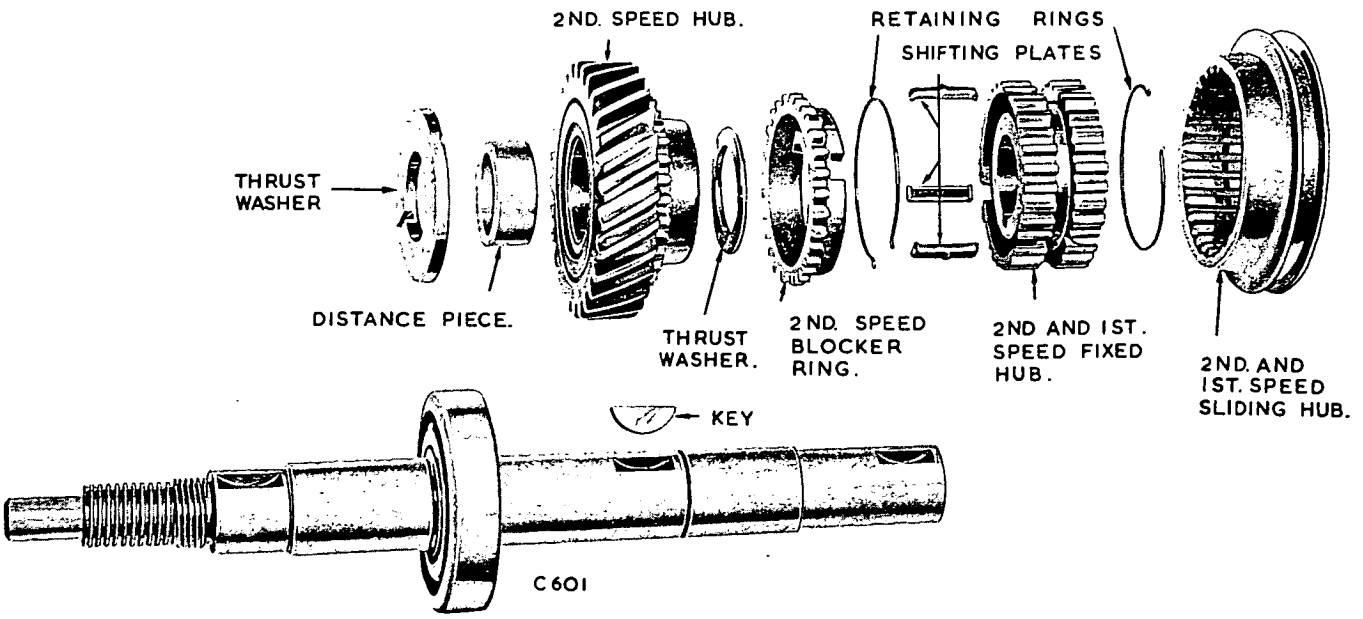


Fig. 63. Dismantling the main driving shaft Stage 3

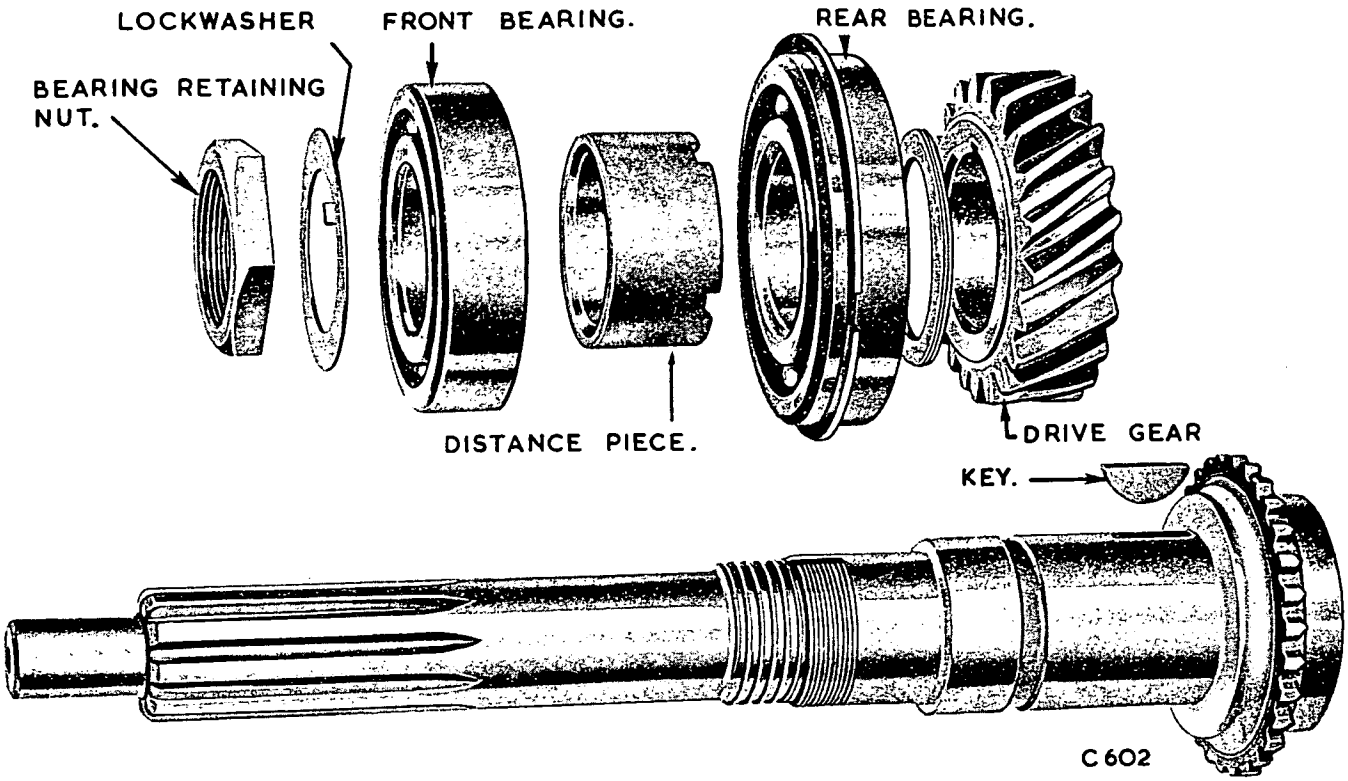


Fig. 64. Dismantling the drive shaft

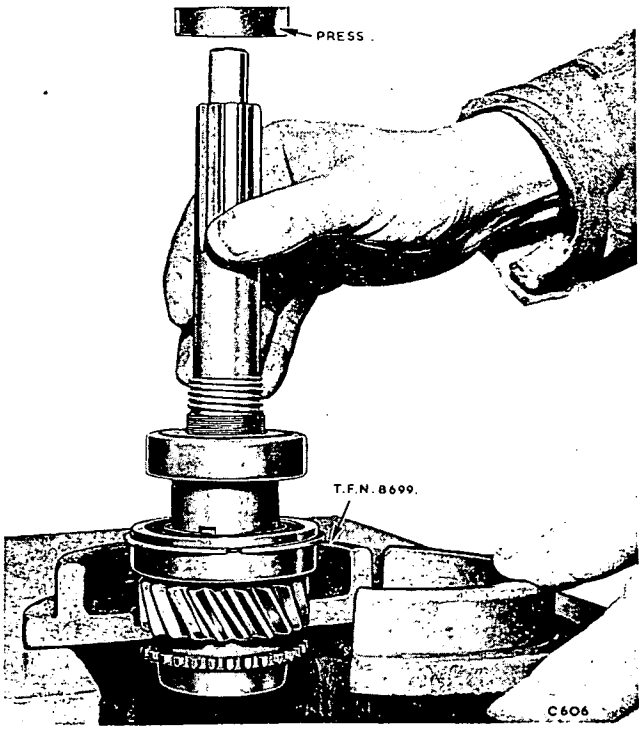


Fig. 65. Pressing components from drive shaft

Re-assembling the Gearbox

If the gear change lever mechanism in the gearbox cover has been dismantled, rebuild it as follows.

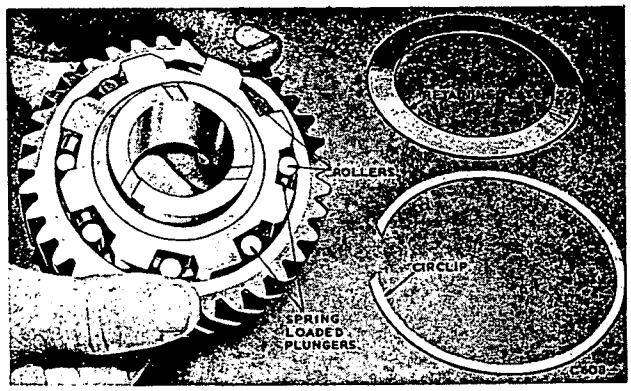


Fig. 66. Dismantling the freewheel

Fit a key to the rocking shaft, and position the shaft into the remote control casing. Fit the selector finger to the shaft and key, fit the washer and nut, tighten and secure with a split pin. The plug can now be fitted to the front end.

If the special stud, providing location for the gear change lever has been removed, refit the stud. Fit the joint and the cover plate, fit the spring washers and dome nuts and tighten.

Check that the gear lever is a good fit in the bearing cup and if not lap the parts together until a good bearing surface is obtained. This operation will eliminate gear lever vibration.

Fit the lever followed by the bearing cup, spring,

retaining plate and circlip. Finally fit the rubber dust excluder.

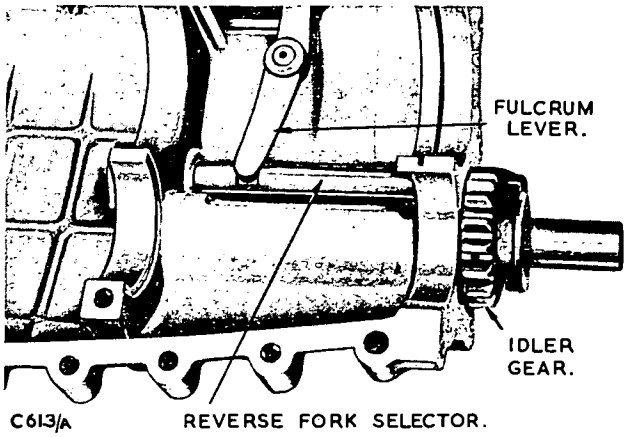


Fig. 67. Reverse selector mechanism

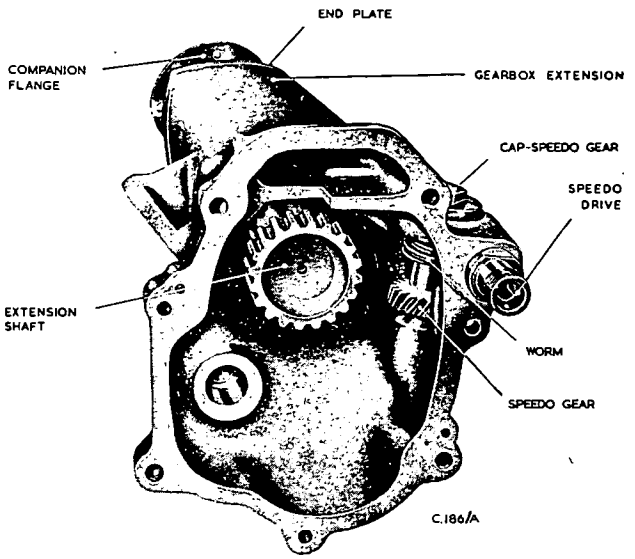


Fig. 68. Gearbox extension

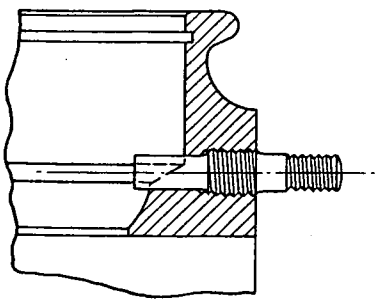


Fig. 69. Gear lever location—special stud

With the joint washer in position, fit the remote control over the studs of the gearbox cover and secure with the spring washers and dome nuts.

Fit a distance piece over each of the selector plate studs in the gearbox cover and position the selector plate, complete with its guide blocks, cut-away edge to the front of the cover Fig.70. Fit a distance piece to each stud and secure with tabwashers and nuts.

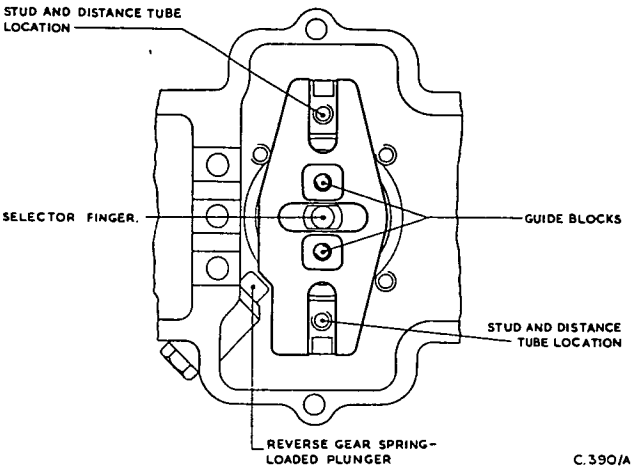


Fig. 70. Selector plate assembly

Layshaft Fig.58.

Where the original gears are being refitted it is important to re-fit the gears the correct way round to mate the established tooth bearing surfaces with those of the opposite gears.

Fit the 2nd. Gear key and using the drift and base T178296 press the shaft into the gear. Fit a spacing washer with its full face to the gear then press on the inner race of the centre roller bearing and fit the outer race. Fit the second space washer with the relieved face to the bearing, then fit the key and press on the 3rd. gear.

Slide on the long distance piece, fit a key and press on the layshaft driving gear using the drift T178297. Fit the short distance piece followed by the front bearing with its circlip towards the gear. Fit the tabwasher, tighten the nut and lock.

Using the base T178298 and the drift T.178297 press the rear bearing into position, fit the key and press on the reverse gear. Fit the tabwasher, tighten the nut and lock.

Main Driving Shaft

See that the 3/32 inch diameter dowels are in position on each side of the centre bearing location.

Locate the centre ball bearing in the base T178300 and using the drift press the mainshaft into position. It is important that the bearing is central with the raised portion of the shaft.

Fit the correct thrust washer to the long end of the shaft, locating its slot over the dowel. Well grease the shaft sufficient to retain the needle rollers and position 40 rollers next to the thrust washer, fit the short distance piece followed by a further 40 needle rollers.

Slide the 2nd. gear hub, gear wheel first, over the rollers, fit the thrust washer to the recess in the 2nd. gear hub and then insert the fixed hub key.

Fit the 2nd. speed blocker ring on the cone face of the 2nd. gear hub.

Fit a retaining ring to the front recess of the fixed hub so that one tongue of the ring engages one of the slots for the shifting plates, the other tongue resting against the recess in the hub.

Fit the fixed hub over the shaft, align the key and keyway and using the split bush TFN8699 and the drift press the hub on until it abuts the thrust washer. Fit the circlip into the groove and again using split bush TFN8699 press the hub back against the circlip to give the necessary clearance.

Fit the second retaining ring to the rear recess of the fixed hub but ensure that the tongue of the ring does not engage the same shifting plate slot as the front ring. Fit and temporarily retain by hand the three shifting plates, turning the 2nd. speed blocker ring as necessary so that the shifting plate notches in the blocker ring engage the ends of the shifting plates. Press the shifting plates down into their slots in the fixed hub and fit the sliding hub, long end first, over the assembly and centralise it. The central position can be felt by the shifting plates locating in the internal groove of the sliding hub.

Assembling the Freewheel

Referring to Fig. 66 fit the springs and plungers and fit the hub partially into position in the gear. Insert the rollers push the assembly right in and fit the retaining plate and circlip.

To continue with the main driving shaft assembly, fit the 1st. speed distance piece into the recess of the fixed hub, mating the notches to the ends of the shifting plates. Fit the 1st. gear thrust washer over the circlip. Grease the shaft and fit two rows of 40 needle rollers, as previously described, with the long distance piece between them, then slide the 1st. Freewheel gear assembly, dog teeth first, over the rollers.

Press the bearing location bush into the rear bearing with the retaining ring in the outer race located adjacent to the flange of the bush. Press the assembled bearing and locating bush, flange first, on to the shaft using the base and drift of Tool 178300. This completes the rear end of the shaft for the time being.

Commencing with the front end of the shaft fit the correct thrust washer locating its groove over the dowel. Grease the shaft and fit 40 rollers, followed by the distance piece and a further 40 rollers. Slide on the 3rd gear hub over the rollers and distance piece. Fit the thrust washer into the recess of the gear hub.

The 3rd/4th. speed fixed hub has a slight counterbore on one face only of the shaft bore. This must face the centre bearing. Fit a retaining ring to this side of the hub so that one tongue of the ring engages one of the slots for the shifting plates, the other tongue resting against the recess in the hub. Fit the key to the shaft and using the split bush TFN.8699 and a suitable drift press on the hub and secure it with its tabwasher locknut.

Fit the shifting plates and the front retaining ring then fit the sliding hub as described for the 1st and 2nd speed sliding hub.

Reverse the shaft and fit the key into the end. With the Reverse gear assembled with its hub and retaining ring, press this assembly on to the shaft and secure it with the tabwasher and special bolt.

Drive Shaft Fig.64.

If the gear has been removed, fit the key to the shaft and using the split bush TFN.8699 beneath the gear, press the shaft into position.

Fit the washer or washers to the gear face and using the drift T178299 press on the drive shaft rear bearing circlip to the front. Fit a needle roller bearing either to the spigot of the main driving shaft or into the recess of the drive shaft.

Fit the 4th. speed blocker ring to the drive shaft then assemble the shaft assemblies together. Trial fit them into the left-hand half of the gearbox casing to ensure that the bearing circlips locate correctly into the grooves. If the assembly has been assembled with its correct positioned original parts this should locate satisfactorily. If not some adjustment may be necessary to the washers located between the drive shaft gear and the rear bearing.

When this location has been determined, part the assemblies, slide the distance piece on to the drive shaft and press on the front bearing.

Fit the tabwasher, tighten the nut and lock.

Checking Drive Shaft and Main Driving Shaft

Again assemble the shaft assemblies together and locate them into the left hand side of the gearbox casing, ensuring that the notches of the blocker engage the ends of the shifting plates and that the bearing circlips are seating in the grooves of the casing.

Fit the selector fork and its original washers to the 3rd/4th. speed selector shaft, fit a lockwasher and secure temporarily with the fork retaining nut, then position the shaft and fork in the gearbox casing. Fit the gearbox cover assembly complete with the remote control mechanism and secure it with the casing studs.

Operate the gear change lever to engage the 3rd. and 4th. speeds in turn and check the engagement, then add or remove distance washers between the selector fork and the selector fork and the collar of the selector shaft, as necessary, to equalise the engagement. Fig.71. When satisfactory lock the nut with the tabwasher.

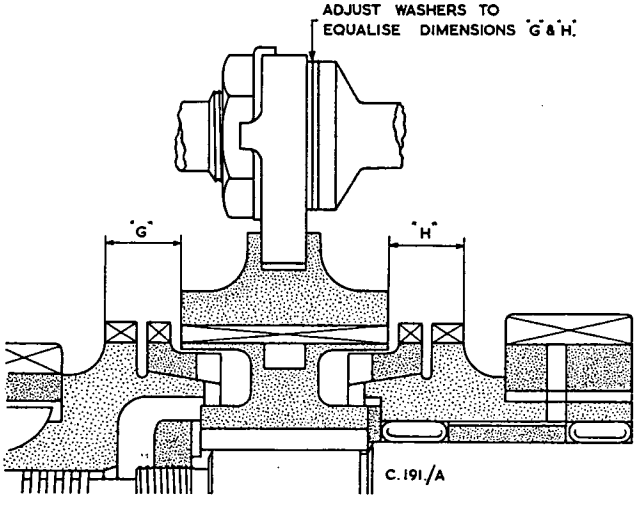


Fig. 71. Equalizing the selector fork location

Fit the 1st/2nd speed selector shaft in a similar manner and ensure adequate engagement of the sliding hub with the 2nd. gear hub. Full engagement with the first gear hub is then assured. The selector shaft in this instance will not have its full location which is partially in the right hand side of the casing.

Remove the gearbox cover assembly, followed by the drive shaft/main driving shaft assembly when these engagement checks have been completed.

Reverse Selector Mechanism

The spindle for the reverse idler gear is a slide fit in the casings being retained by one of the gearbox casing bolts. This spindle and the bush of the gear should be examined for wear before reassembly and renewed if worn badly.

The phosphor bronze bush is available as a spare and the old one should be pressed out and a new bush pressed in. The three 1/8" inch diameter holes should then be drilled through the bush from the gear and then the bore should be sized to .782 + .0005 inch.

To assemble the reverse gear mechanism Fig.67 slide the cut away end of the idler gear spindle into the right hand side of the casing. Fit the fork of the selector into the groove of the gear and slide the selector and gear into their respective locations.

Fit the tabwasher and pivot from the outside and lock. On the inside fit the fulcrum lever to the pivot pin, engaging its lower end in the slot in the reverse fork selector.

Final Assembly of Gearbox

Fit the drive shaft/main driving shaft assemblies in position in the right hand half of the gearbox casing locating the bearing circlips in the grooves.

Fit the layshaft assembly to the casing, meshing its mating gears and locating the circlip of the front bearing in the groove of the casing.

Fit the 1st/2nd. and 3rd/4th. selector shaft and fork assemblies into the sliding hubs ignoring the groove locations until the casings are fitted together.

Apply a thin coating of jointing compound to the mating gearbox joint faces and assemble the two halves together, ensuring that the bearing circlips are correct in the grooves. Fit the securing bolts washers and nuts and tighten to a torque loading figure of 7 to 9 lb.ft.

Overtightening can cause distortion and misalignment of the bearings resulting in noisy races.

Position the 1st/2nd. and 3rd/4th. selector shafts and put them in the neutral position. Fit the reverse selector shaft and engage it with the upper end of the reverse fulcrum lever.

Before fitting the gearbox cover attention should be given to the selector ball units. There are two types fitted as shown in Fig. 72 the earlier types have no positive depth location while the later type are identical except that the spring and ball housing is shouldered. The reverse ball selector of each type has a different spring tension and is stamped 'R' for identification. Its location is on the right hand side of the gearbox.

First check each unit to see that the ball will respond and seat itself with its spring pressure.

Screw them into the gearbox cover until the ball only protrudes into the half round selector shaft locations and the ball housing is just clear. From this position they can be finally adjusted back but they must not be screwed down otherwise they will foul the shaft and damage the housing thus preventing the ball from seating.

If an overdrive contact switch is fitted to the cover remove it at this stage.

To continue with the assembly, apply a thin coat of jointing compound to the faces and assemble the gearbox cover to the casings and secure with spring washers and nuts.

Check the gear lever in its engaged positions and if harsh or heavy the selector ball unit should be carefully unscrewed until correct. Peen as shown in Fig. 72 to finally lock them into position.

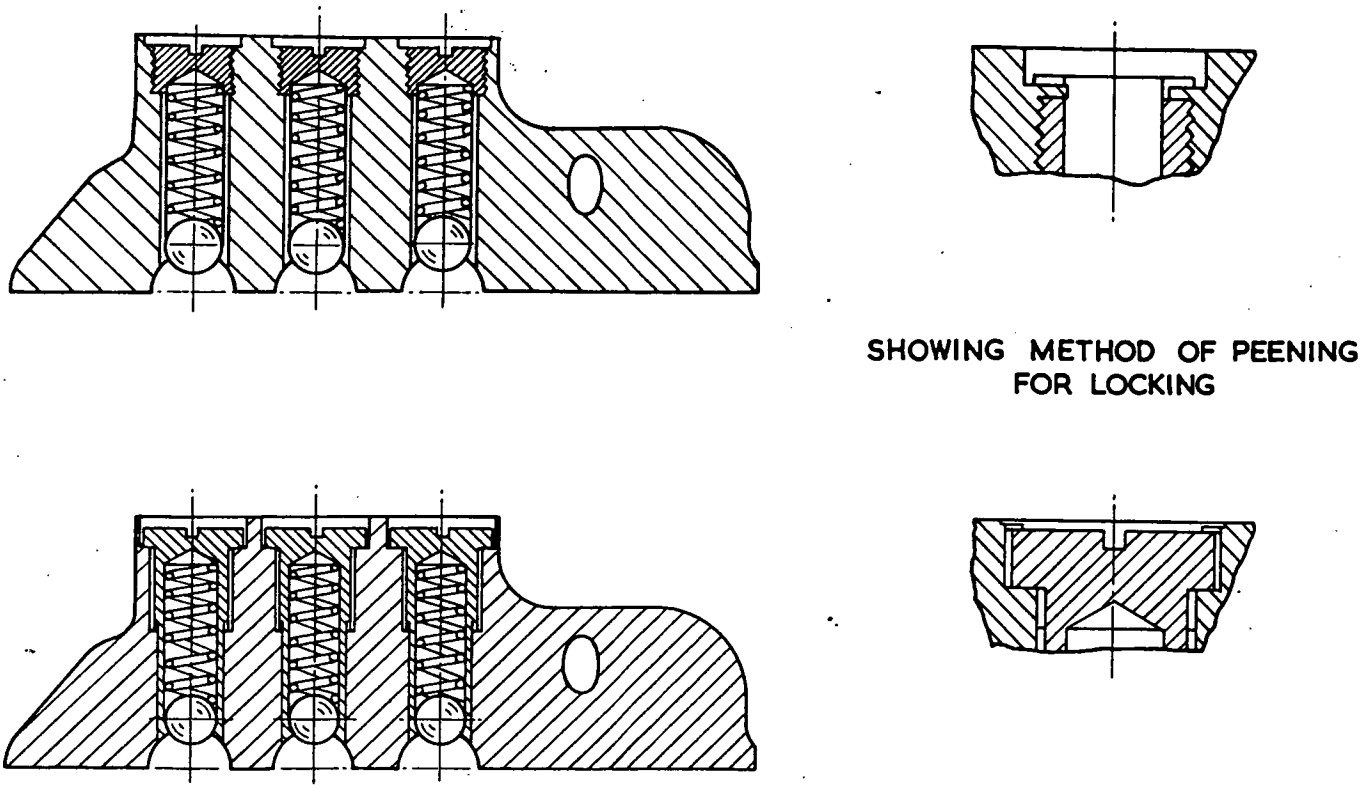


Fig. 72. Selector ball units

Clutch Casing

The leather gaiters at the clutch operating lever slots and also the timing aperture are only to be found on later cars.

To fit the clutch casing to the gearbox casing, fit a new joint washer to the front face, using jointing compound and assemble the clutch casing over the end of the drive shaft, locating the drive shaft front bearing into its housing. Secure the casing to the gearbox with the nuts and spring washers.

Fit the clutch fulcrum bracket to its correct position, right hand side for RH drive and left hand side for LH drive, and fit the tabwasher, tighten and setscrew and lock. Insert the clutch lever, fit the fulcrum pin and secure with a split pin.

Fit the clutch release bearing and cup assembly into the fork of the lever and secure it with its spring retainers.

Type 404 Cars.

Gearbox Extension Re-assembly

Fit the key to the 1st. reduction speedometer driven gear and fit the worm gear, then insert the gears into the extension casing with the lower end of the gear against its thrust pad. Screw the cover into position.

Fit the 2nd. reduction speedo driven gear to the drive union, then screw the union into position ensuring that the teeth of the gear and worm mesh correctly.

Fit the ball race to the extension shaft and secure it with the circlips. Fit the end plate to the shaft then fit the key and companion flange. Fit the tabwasher and nut, tighten the nut securely and lock.

Fit a new joint washer to the rear end of the extension, then insert the extension shaft and secure the end plate with the four set bolts and spring washers.

Finally assemble the extension unit to the rear of the gearbox by fitting a new joint washer, using jointing compound, then taking care that the teeth of the extension shaft engage in the hub and that the speedo gears mesh correctly, attach the extension unit to the gearbox and secure it with the nuts and spring washers.

Overdrive Contact Switch and Reverse Switch

These switches, Lucas 515500-45 are identical.

The reverse switch has a positive washer when it is fitted to the side of the gearbox, while the overdrive switch in the gearbox cover is controlled for height by shims. In this way the switch is smoothly operated by the selector shaft when Top Gear is engaged.

Both switches can be fitted and checked when the gearbox is in the car, but before the floorboards, tunnelling etc., are refitted.

Sectional view of overdrive

Laycock Part Number	Description	No. per Unit.
XN.24	Valve Plug Washer	2
XN.440	Valve Spring	2
XN.36	Ball Valve Plunger	2
XN.378	Drain Plug	1
XN.406	Drain Plug Washer	1
XN.479	Welch Washer	1
XN.536	Pump Plunger Spring	1
XN.614	Plug for Valve	2
XN.620	Plug for Pump Body	1
XN.621	Filter Bolt	1
XN.629	Thrust Washer	1
XN.631	Thrust Washer	1
XN.634	Thrust Washer	1
XN.649	Operating Valve	1
XN.657	Spacing Washer in the following sizes :–	1
XN.657E	.146" ± .0005 thick	
XN.657F	.151" ± .0005 thick	
XN.657G	.156" ± .0005 thick	
XN.657H	.161" ± .0005 thick	
XN.657J	.166" ± .0005 thick	
XN.663	Cam	1
XN.664	Stud	2
XN.667	Thrust Washer in the following sizes :–	1
XN.667A	.113/.114" thick	
XN.667B	.107/108" thick	
XN.667C	.101/.102" thick	
XN.667D	.095/.096" thick	
XN.667E	.089/.090" thick	
XN.667F	.083/.084" thick	
XN.667G	.077/.078" thick	
XN.677	Stud	2
XN.679	Stud	2
XN.704	Bridge Piece	2
XN.712	Valve Operating Shaft	1
XN.723	Pump Plunger Guide Peg	1
XN.807	Stud	3
XN.813	Operating Valve Setting Lever	1
XN.814	Operating Piston Ring	2
XN.814	Accumulator Piston Ring	2
XN.819	Stud	4
XN.823	Side Cover Plate Joint	1
XN.845	Pump Body	1
XN.879	Operating Piston	2
XN.888	Stud	1
XN.1058	Filter Distance Tube	1
XN.1082	Speedo Bearing Locking Screw	1
XN.1085	Slotted Nut	1
XN.1090	Coupling Flange	1
XN.1099	Speedo Driven Gear	1
XN.4010	Uni-Directional Clutch Inner Member	1
XN.4011	Uni-Directional Clutch Cage	1
XN.4059	Spring for Uni-Directional Clutch	1

Laycock Part Number	Description	No. per Unit.
XN.4081	Accumulator Housing	1
XN.4246	Accumulator Piston	2
XN.4266	Thrust Washer	3
XN.4283	Solenoid Stop	1
XN.4370	Breather	1
XN.4372	Solenoid Lever	1
XN.4373	Collar for Valve Operating Shaft	1
XN.4429	Stone Guard	1
XN.4486	'O' Ring	2
XN.4804	Filter	1
XN.4941	Washer for Locking Screw	1
XN.4970	Accumulator Spring	1
XN.5024	Ball Bearing 50 x 90 x 11m/m	1
XN.5025	Ball Bearing 1¼ x 2¾ x 11/16"	1
XN.5026	Ball Bearing 30 x 60 x 16 m/m	1
XN.5027	Torrington Bearing B.78	6
XN.5088	Solenoid	1
YN.2128	Brake Ring	1
YN.2161	Front Cover Plate Joint	1
REF.131/5	'O' Ring 1¾" dia.	2
REF.6024	Split Pin 1/8" x 1½"	1
REF.6127	Taper Pin No.000 1/16" x 5/8"	2
REF.9003	Seegar Circlip 1.7/8" dia.	1
REF.9108	Seegar Circlip 90 m/m	1
REF.9210	Oil Seal	1
REF.9802	Steel Ball ¼" dia.	1
REF.9809	Steel Ball 5/16" dia.	1
AT.20102	Bolt ¼" BSF	1
AT.20201	Setscrew No.10 Cheesehead	4
AT.20202	Setscrew 5/16" N.F. 2" x 1¾"	2
AT.20301	Plain Washer 3/16" dia.	1
AT.20302	Plain Washer ¼" dia.	1
AT.20306	Plain Washer ¾" dia.	1
AT.20401	Hexagon Nut ¼" UNF.2.	4
AT.20402	Hexagon Nut 5/16" NF2.	9
AT.20501	Hexagon Nut ¼" BSF	1
AT.20601	Spring Washer	5
AT.20603	Spring Washer	5
AT.20701	Tabwasher	4

Bristol Part Number	Description		No. per Unit.
N.450330	Hub-Reverse Gear		1
N.450790	Nut-Retaining Mainshaft		1
N.451180	Retaining Ring		1
N.451190	Joint-Gearbox-Rear		1
N.451730	Tabwasher		1
N.453220	Key		1
N.454080	Bearing Retainer		1
N.454090	Circlip		1
N.454120	Input Shaft		1
N.454130–1	Distance Piece .0975)		
N.454130–2	Distance Piece .1015)	Selective	1
N.454130–3	Distance Piece .1055)		
N.454130–4	Distance Piece .1095)		
N.454140	Adaptor Casting		1
N.454150	Circlip		1
N.454370	Ball Race		1
FN.104/L	¼" BSF Nut		4
N.454410	Stud		4
N.455040	Gear		1

Selective Assemblies

Pump Plunger Assembly S P.30003

Laycock Part No.		
XN.828	Pump Plunger	1
XN.4545	Roller	1
XN.829	Pin	1
REF.6302	Mills Pin 1/16" x ½"	1

Clutch Thrust Ring Assembly SP.30004

XN.816	Thrust Ring	1
XN.817	Pin for Clutch Spring (long)	4
XN.818	Pin for Clutch Spring (short)	4
XN.830	Pin for Thrust Ring	4

Clutch Sliding Member SP.30005

YN.78	Sliding Member	1
XN.625	Cone Clutch Inner Lining	1
XN.1092	Cone Clutch Outer Lining	1
XN.725	Rivet	24

Sunwheel Assembly SP.30007

XN.4194	Sunwheel	1
XN.4213	Bush for Sunwheel	1

Laycock Part Number	Description	No. per Unit.
	Planet Carrier Assembly SP.30008	
YN.2185	Planet Carrier	1
XN.4400	Planet Wheel 15 teeth	3
XN.799	Planet Wheel 21 teeth	3
XN.5027	Planet Bearings-Torrington B.78	6 sets
XN.4399	Planet Bearing Shaft	3
REF.6388	Mills Pin 3/32" x 7/16"	3
XN.654	Key for Planet	3
XN.4266	Thrust Washer	3
XN.631	Thrust Washer	1
	Annulus Assembly SP.30009	
YN.2052	Annulus	1
XN.637	Bush	1
XN.651	Uni-Directional Clutch-Outer Member	1
	Accumulator Piston Assembly SP.30011	
XN.4246	Accumulator Piston	1
XN.814	Accumulator Piston Ring	2 sets
XN.4081	Piston Housing	1
REF 131/5	'O' Ring 1¾" dia.	2
	Spacing Tube & Washer Assembly SP.30012	
XN.4245	Tube for Piston Housing	1
XN.4244	Washer	1
	Clutch Spring Set SP.30014	
XN.687	Clutch Spring-long	4
XN.1071	Clutch Spring-short	4
	Steel Roller Set. SP.30015	
REF.135/1	Steel Rollers 3/8" x ½"	12
	Speedo Bearing Assembly SP.30020	
XN.1081	Speedo Bearing	1
XN.1083	Speedo Drive Screwed End	1
XN.1087	Speedo Bearing Oil Seal	1
	Solenoid Bracket Assembly SP.30028	
YN.2118	Solenoid Bracket	1
XN.4097	Pin	1
XN.4283	Solenoid Stop	1

	Laycock Part Number	Description	No. per Unit.
		Rear Casing Assembly SP.30033	
	WN.184	Rear Casing	1
+	XN.819	Stud	4
		Speedo Drive Assembly SP.30048	
	XN.1081	Speedo Bearing	1
	XN.1083	Speedo Drive Screwed End.	1
	XN.1087	Speedo Bearing Oil Seal	1
+	XN.1099	Speedo Drive Gear	1
		Front Casing Assembly SP.30063	
	WN.1267	Front Casing	1
	XN.616	Screwed Plug	8
	XN.617	Screwed Plug	2
	XN.821	Screwed Plug	2
	XN.632	Bush	2
+	XN.479	Welch Washer	1
+	XN.712	Valve Operating Shaft	1
+	XN.813	Valve Setting Lever	1
+	XN.677	Stud	2
+	XN.807	Stud	3
+	XN.664	Stud	2
+	XN.679	Stud	2
+	XN.888	Stud	1
+	XN.723	Guide Peg-Pump Plunger	1
	XN.785	Cam Lever	1
+	XN.6127	Taper Pin No.000	2
+	XN.4486	'O' Ring	2
	REF 9901	No.2 Parker Kalon Drive Screws	2
	XN.768	Name Plate	1

Items marked thus + are also supplied separately.

The Laycock de Normanville Overdrive Unit

The Overdrive Unit is a standard fitment to the Type 405 Car being fitted to the rear of the Gearbox. It is self contained and in conjunction with the gearbox top gear provides an extra high gear when circumstances permit. This extra gear permits a fast cruising speed to be maintained, while the engine revolutions are reduced, thereby reducing engine wear and petrol consumption.

The overdrive is operated by a solenoid fitted to the left-hand side of the unit and is controlled by a plunger type switch fitted to the gearbox cover immediately forward of the gear change turret assembly. A magnetic relay switch is situated on the offside of the instrument panel.

When top gear is engaged, the plunger type switch comes into operation allowing the current from the ignition switch to continue to the magnetic relay switch on the panel. This latter switch is under the control of the driver and may be operated when it is desired to engage or disengage the overdrive. The magnetic relay switch will automatically switch 'off' when top gear is disengaged.

It is recommended that the overdrive is not brought into use at speeds below 40-45 mph.

Care and Lubrication

The oil in the Overdrive is common with that in the Gearbox.

Recommended grades of oil to use are:

MOBILOIL A.
ESSOLUBE 30
ENERGOL SAE 30
SHELL X-100 30
CASTROL XL.

The oil capacity of the Gearbox and Overdrive is 3.1/2 pints.

Checking Gearbox and Overdrive Oil Level

Set the car on level ground. Lift the carpet in front of the right hand front seat to expose the panel in the side of the front tunnel. Release the screws and remove the Panel (Fig.73). Clean off any dirt in the vicinity then remove the filler plug from the overdrive unit. If the oil is low fill until it is visible in the filler neck allowing sufficient time for the oil to find its level throughout the gearbox and overdrive unit.

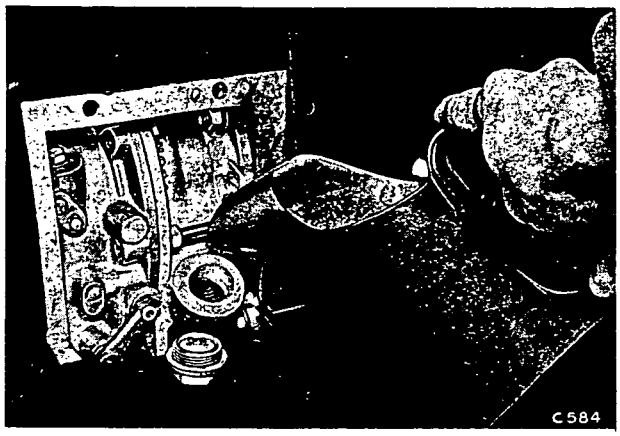


Fig. 73. Checking gearbox and overdrive oil level

Draining and Refilling Gearbox and Overdrive

To drain the unit it is necessary to remove the drain plugs from both the gearbox and overdrive unit Fig. 74 but refilling takes place through the overdrive only.

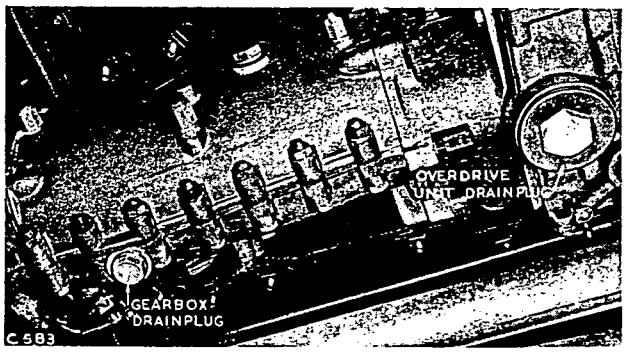


Fig. 74. Gearbox and overdrive unit drain plugs

After refilling drive the car a short distance then again top up with oil. This is necessary because some of the oil will be taken into the hydraulic system of the overdrive.

Never run a car without oil in the unit since air may enter this hydraulic system.

Cleanliness is essential and the smallest particle of dirt or 'fluff' from a wiping cloth which finds its way into

a valve of the overdrive mechanism will cause a great deal of unnecessary trouble. Make sure that the oil used for filling is perfectly clean.

Fitting a replacement Overdrive Unit to a Gearbox.

The Laycock de Normanville overdrive is adapted to the gearbox of the Bristol Car by an adaptor casting and a selective Input Shaft assembly. These parts are peculiar to the 'Bristol' Car. The adaptor casting is interchangeable with the gearbox but the splines of the Input shaft which locate in the Reverse Gear of the gearboxes are not interchangeable consequently the whole Input shaft assembly must at all times be kept with the gearbox.

To replace a complete Overdrive Unit the following procedure should be used.

Using Figs.75 & 76 dismantle the overdrive unit from the gearbox at Joint 'A' which will leave the reverse gear firmly in position on the rear face of the gearbox from where it can only be removed by the complete dismantling of the gearbox.

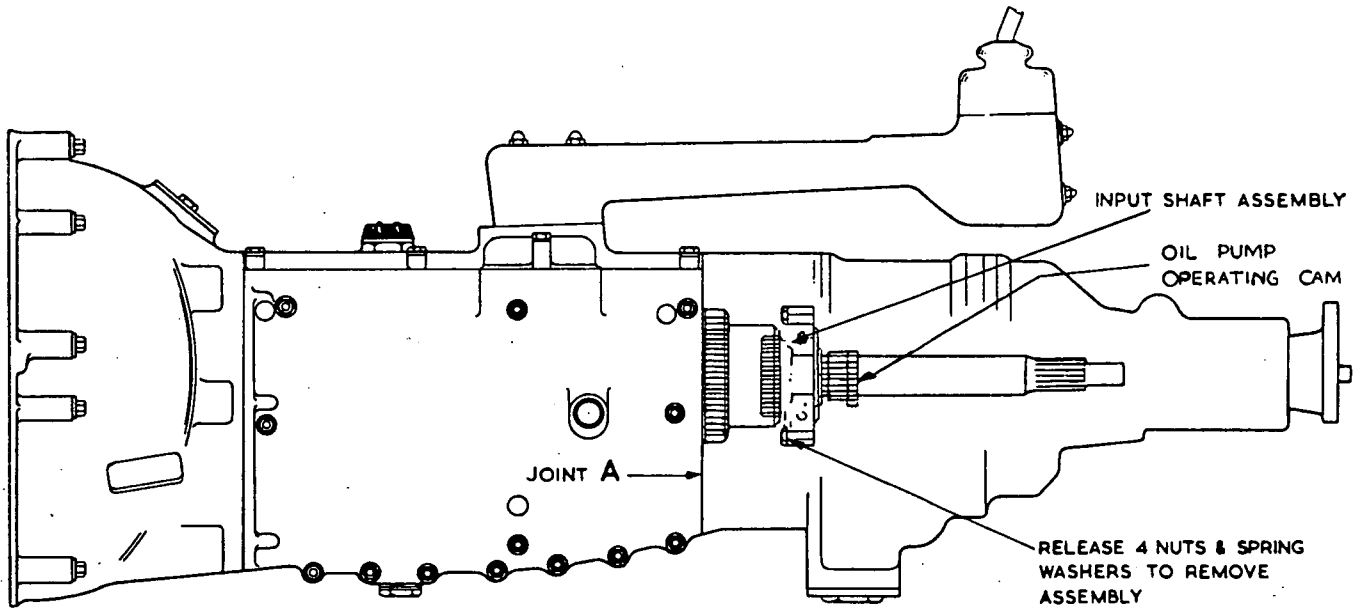


Fig. 75 Dismantling the overdrive unit from the gearbox

Next, from the front of the overdrive unit remove the four 1/4" Nuts and Spring Washers and take out the Input shaft assembly. This is a selective 'Bristol' assembly comprising the input shaft, bearing housing, ball race, selective distance piece and circlips and it should not be dismantled except for obvious repair or renewal of the ball race. The overdrive oil pump operating cam will either be on the front splines of the input shaft when it is withdrawn or left as a loose piece in the front of the overdrive.

This removed assembly should now be fitted into the replacement overdrive unit by the following method.

Visually check the splines at the rear of the bore in the overdrive which mate with the input shaft. There are two sets of identical splines here and the rear splines can be freely moved in an anti-clockwise direction with a long screwdriver or similar bar until they are both in line. It will be noted that rotating the coupling flange at the rear does not alter the relationship of the two sets of rear splines so that when they are initially lined up they will remain so.

Locate the overdrive oil pump operating cam (cam inwards) on the input shaft and insert the shaft into the overdrive. Press down the spring loaded oil pump plunger to allow the roller to locate on the cam and locate the four holes in the aluminium bearing retainer on to the studs.

Holding the input shaft, turn the coupling flange on the rear of the overdrive until the rear splines locate and push the shaft in to the bearing retainer face. The four spring washers and nuts can then be positioned and tightened.

Couple up the splines of the input shaft with the reverse gear of the gearbox and finally tighten the overdrive to the gearbox at Joint 'A'.

Diagnosis and Rectification of Faults

Five symptoms are numercially given and each has items for finding and rectifying the fault in the quickest manner.

The tests are arranged in progressive order so as to avoid any unnecessary dismantling.

(1) OVERDRIVE DOES NOT ENGAGE.

(a) Insufficient oil in the unit.

The overdrive unit must be filled to the level of the filler plug.

(b) Electrical Control System (Fig.77

When the electrical circuit is working correctly the solenoid can be heard to 'click' in and out when top

gear is engaged, the ignition switched on and the overdrive (dashboard) switched moved to the 'on' and 'off' positions. When the gear lever is moved into any other gear the circuit should become 'dead', that is, no 'clicking' of the solenoid should be heard.

To check this setting switch on the ignition, engage top gear and switch the overdrive switch into the 'on' position. This should operate the solenoid and move the valve operating shaft to the overdrive position. The hole in the setting lever should now be

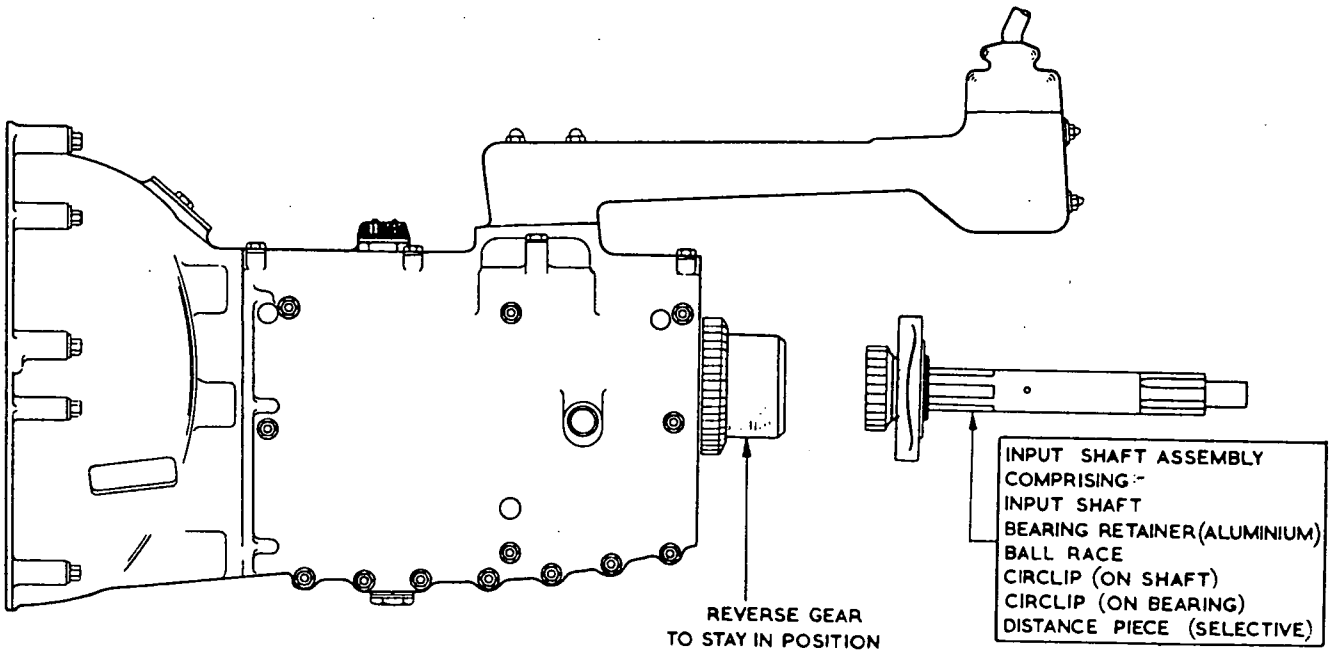


Fig. 76. Dismantling the overdrive unit from the gearbox

It has been found that most operational failures are due to corroded terminals and faulty wiring, so make a point of checking over the wiring and connections first.

Check the battery.

Check that voltage appears at the overdrive switch on the gearbox cover when the ignition is switched on. If so, apply a short circuit temporarily to the gearbox switch and switch on the ignition. If the circuit now operates, either the switch is faulty or its height in the gearbox needs adjusting by means of the shims fitted beneath it.

If the circuit still fails to operate when the overdrive (dashboard) switch is used locate the snap connector adjacent to the overdrive solenoid and pull out the wire. Check for continuity between the wire from the switch to chassis when the overdrive (dashboard) switch is operated. If there is no continuity the overdrive (dashboard) switch is faulty. If continuity exists the solenoid switch is faulty.

(c) Solenoid Lever not set correctly. Figs. 78 & 79

On the opposite side of the overdrive to the solenoid will be seen a valve setting lever (A) attached to the valve operating shaft (B). In the outer end of the lever is a 3/16 inch dia. hole (C) which must line up with the same diameter hole (D) in the overdrive casing when the lever is in the correct position.

in line with the hole in the overdrive casing and it should be possible to insert a 3/16 inch dia. pin or drill shank (E) into the two holes.

If the holes do not line up, the solenoid lever must be reset using the following procedure.

Slack off the clamping bolt (F) in the solenoid lever.

Energise the solenoid as already described and insert the 3/16 inch dia. pin through the hole in the valve setting lever into the hole in the casing.

Hold the solenoid lever (G) downwards so that it bears lightly against the solenoid stop (H) and tighten the clamping bolt (F).

Make sure that there is no end float in the valve operating shaft by pressing the valve setting lever and the solenoid lever inwards simultaneously when tightening the solenoid lever bolt. This expands the oil seals at either end of the shaft and prevents oil leakage.

Remove the pin from the setting lever and operate the solenoid several times by switching the ignition on and off (top gear engaged and the overdrive switch 'on').

Check that the hole in the valve setting lever corresponds with the hole in the casing by inserting the pin again.

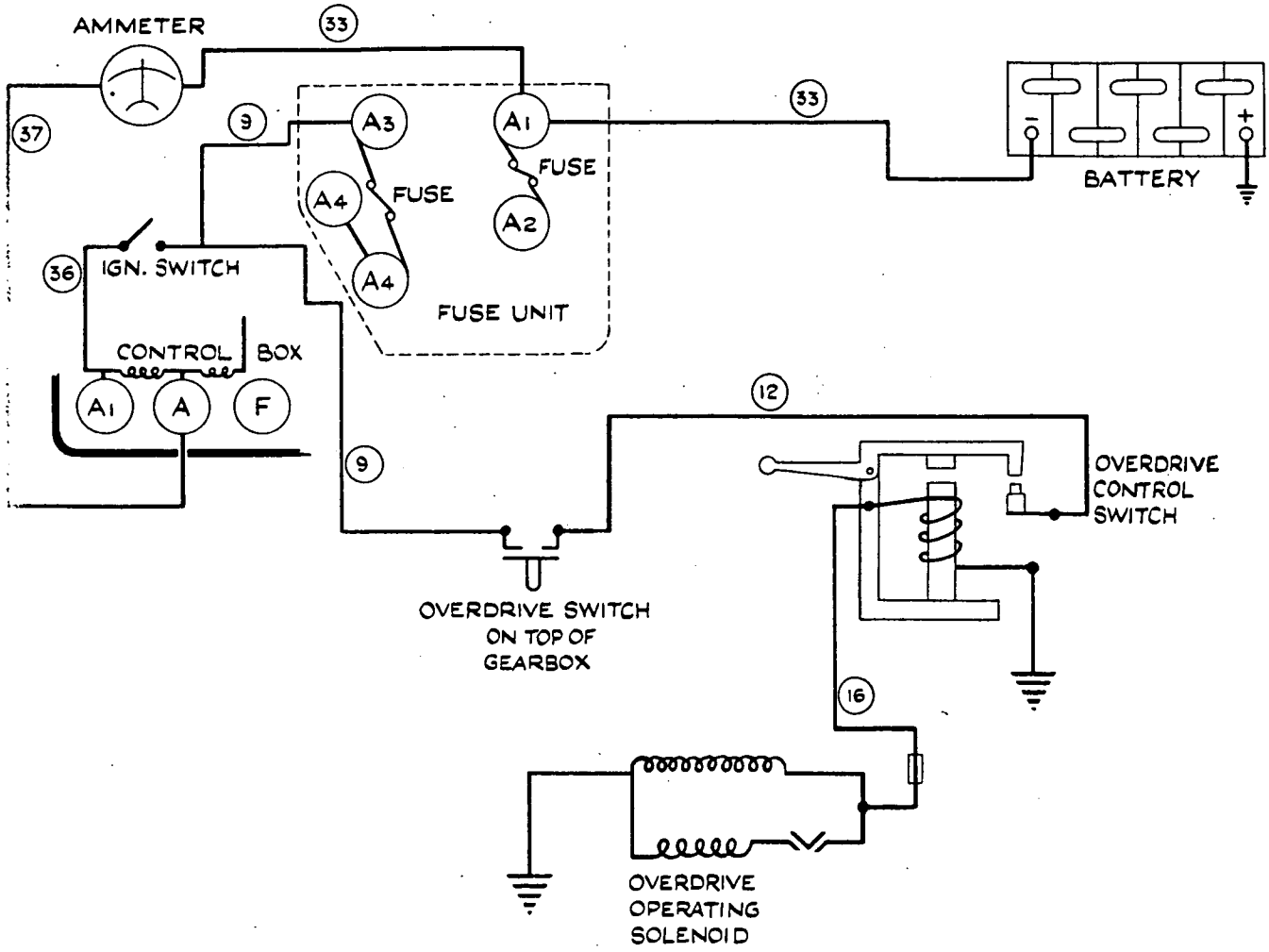


Fig. 77. Electrical control system

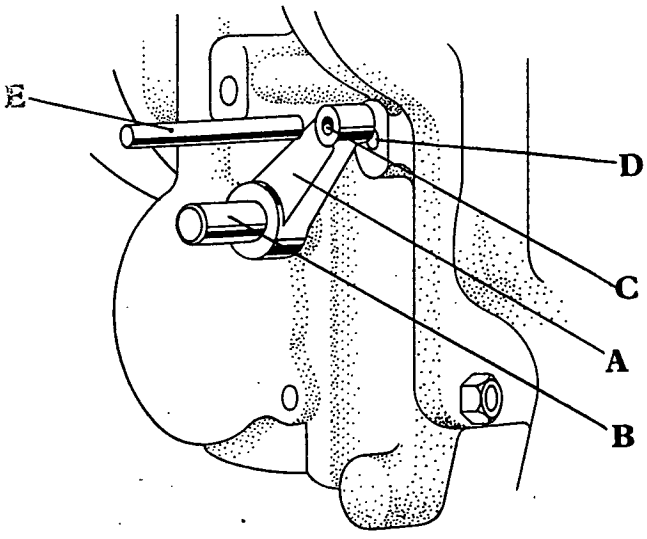


Fig. 78. Setting the operating valve

(d) Operating Valve leaking due to foreign matter in the Valve Seat Fig. 80

The operating valve plug is situated at the top right hand side of the overdrive casing almost over the valve setting lever.

Before attempting to remove this plug it is very important to release all oil pressure from the system by operating the valve setting lever by hand about ten (10) times.

On removing the plug (I) and the spring (J) and plunger (K) the steel ball 'L' will be seen in the bottom of the valve chamber and a small magnet could be used to extract the ball. To remove the valve (M) a short length of wire 3/32 dia. should be inserted into the hole in the centre of the valve, which can then be lifted out.

Clean thoroughly and examine the seatings and if necessary 'grind-in' the ball seating of the operating valve using a spare 5/16 inch dia. steel ball and a fine grade grinding paste. Clean off all traces of the grinding paste and re-assemble.

The steel ball can be assisted in its reseating in the overdrive casing by lightly tapping on to its seat

using a soft copper drift.

(e) No Oil Pressure.

If the unit still fails to operate and the operating valve is seating and working correctly, check that the oil pump is working.

Jack up the rear wheels of the car, operate the valve setting lever about ten (10) times to release any oil pressure from the system and then remove the operating valve plug.

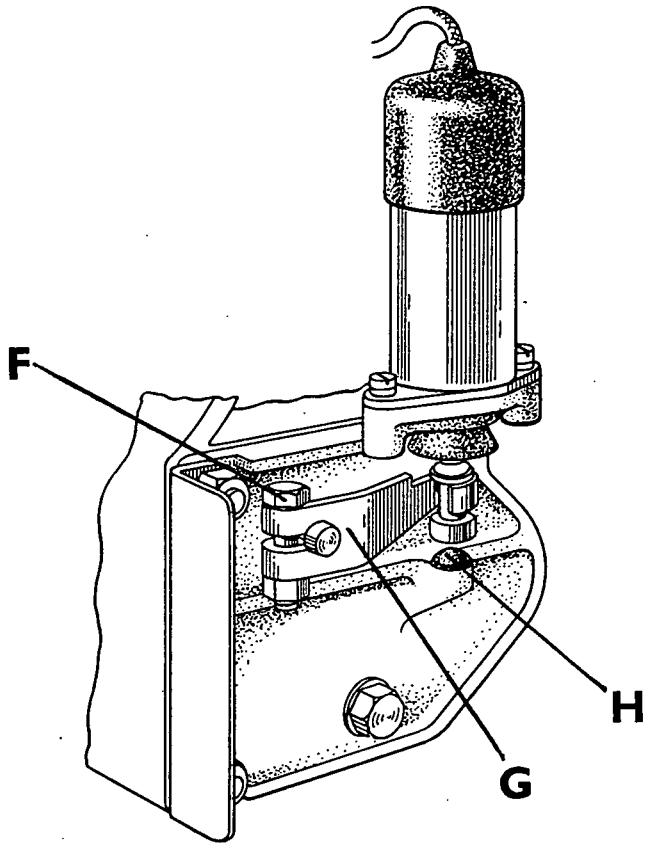


Fig. 79. Setting the solenoid lever

Start the engine and engage top gear with the engine ticking over slowly and note if any oil is being pumped into the valve chamber. If none appears, then the oil pump is not working probably due to foreign matter on the seat of the non-return valve. A flow of oil into the valve chamber does not indicate that the pressure is correct and this should be checked.

An adaptor Part No. 7H 5899 should be screwed into the casing, in place of the operating valve plug, and an 800 lb. per square inch pressure gauge screwed into the 1/8" BSP. thread of the adaptor.

Start up the engine, engage top gear and switch on the overdrive. The pressure gauge should read 500 p.s.i. ± 10 p.s.i. Low pressure indicates leakage and to remedy this fault proceed as follows:

Remove the drain plug (E) Fig. 81 and allow the oil to drain.
Remove the solenoid.
Slacken off the clamping bolt of the solenoid lever and remove the solenoid lever and the distance collar.
The solenoid bracket is secured by two (2) 5/16" dia. studs and two (2) 5/16" dia. bolts the heads of which are painted RED.

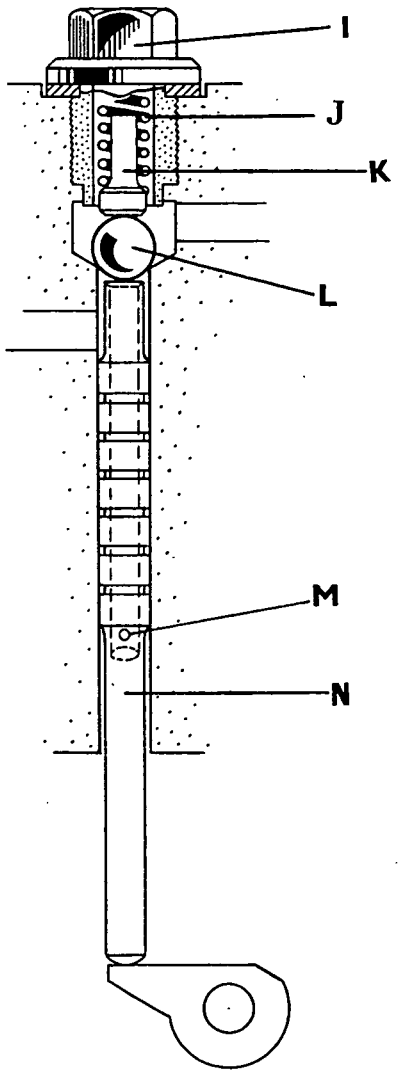


Fig. 80. The operating valve

Remove the nuts, washers and stoneguard from the studs before touching the bolts.

The two (2) bolts should now be slackened off together releasing the pressure on the internal accumulator spring.

The pump valve plug 'A' Fig. 81 can now be removed with a box spanner followed by the spring, plunger and ball.

Clean the valve seat and if necessary re-seat the ball by tapping it gently on to its seat using a copper drift.

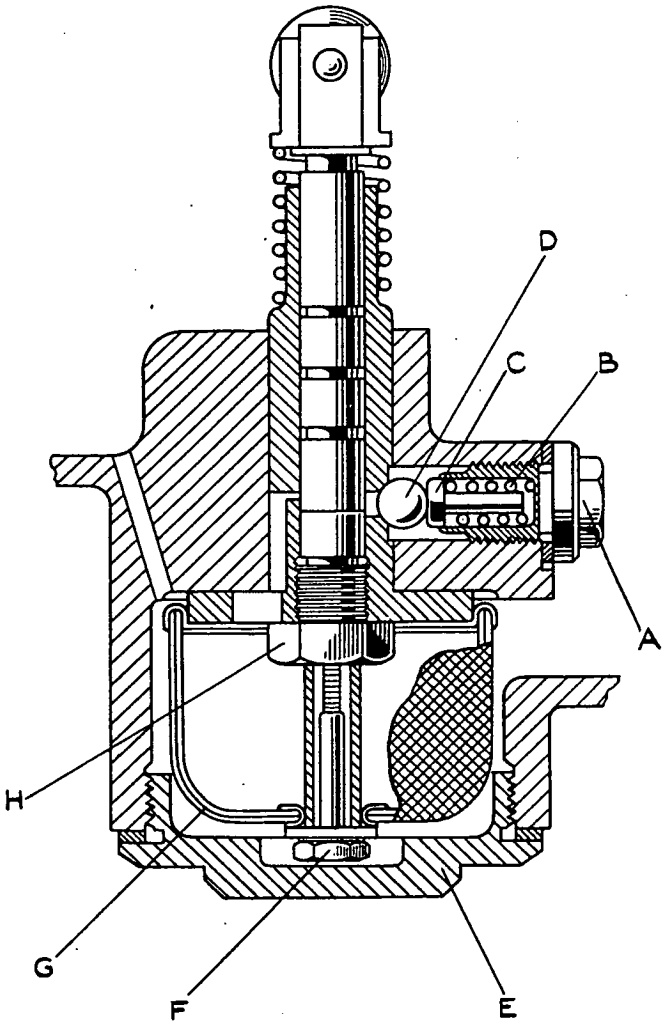


Fig. 81. Section view of oil pump showing the non-return valve

Re-assemble the valve and ensure that the valve plug is well tightened on to the soft copper washer which should be replaced by a new washer if damaged in any way.

Re-assemble the solenoid bracket and parts the reverse of the above procedure and ensure that the accumulator spring is located on its spigot at the back of the solenoid bracket. After re-assembly it will be necessary to reset the solenoid lever to the procedure already given.

(2) OVERDRIVE ON ALL GEARS.

(a) Electrical Control System.

If overdrive is obtainable on all gears the overdrive switch on the gearbox cover could be stuck.

(b) Solenoid lever not set correctly (described previously).

(3) OVERDRIVE DOES NOT RELEASE.

If this happens do not try to reverse the car as this may result in unnecessary damage.

(a) Blocked Restrictor Jet in the Operating Valve (Fig.80)

The operating valve should be removed as already described and the restrictor jet (M) should be cleared.

(b) Electrical system not operating correctly.

If the unit remains in overdrive after the ignition has been switched off then the electrical circuit is not at fault. If however the unit cuts in and out with the ignition switch a short circuit in the wiring or a faulty relay should be looked for.

(c) Solenoid lever not set correctly or Solenoid Plunger sticking.

It is very unlikely that any mal-adjustment of the lever will develop to prevent the overdrive from releasing. The setting and working of the valve setting lever, however, should be checked and corrected if necessary.

(d) Sticking Cone Clutch.

This fault has been known to occur as a result of heating up on a long run on a new unit before the linings are fully bedded in. The clutch invariably releases itself when it has cooled down a little, or it can be released by giving the casing a sharp blow with a hide hammer over the brake ring between the body of the overdrive and the rear cover.

(e) Damaged parts within the unit necessitating removal and dismantling of the unit for inspection.

Internal damage however is very unusual and it is recommended that all tests should be re-checked before deciding to remove the unit.

(4) CLUTCH SLIP IN OVERDRIVE.

(a) Insufficient oil in overdrive and gearbox.

The correct oil level must be maintained.

(b) Solenoid lever not set correctly.

Check the setting as already described.

(c) Insufficient Hydraulic Pressure.

Probably due to foreign matter on the ball seat of the pump valve or operating valve. Check the pressure with the adaptor and gauge as already described and clean and reseat valve if required.

(d) Worn or burned out cone clutch outer lining.

This is not experienced even after very large mileages unless the car has been driven for a long time in overdrive with the clutch slipping due to causes, a, b, and c given above. Removal of the unit and replacement of a cone clutch member would be necessary in this case.

(5) CLUTCH SLIP IN REVERSE OR FREE WHEEL CONDITION ON OVERDRIVE.

(a) Blocked restrictor jet in the operating valve causing sluggish return movement of the cone clutch.

Clean the restrictor jet as already described.

To Obtain Access to the Overdrive Unit for Testing and Rectification of Faults

Remove the two front seats and the carpets.

Detach the turret gear change by removing the four (4) domed nuts and lifting clear of the studs. This will allow the front tunnelling to be removed.

Remove the floorboards.

Re-attach the turret gear change.

Removing and Refitting the Overdrive Unit Only

Remove the two front seats and the carpets.

Detach the turret gear change by removing the four (4) domed nuts and lifting clear of the studs. This will allow the front tunnelling to be removed.

Remove the floorboards.

Unscrew the drain plugs (Fig.74) and drain the gearbox and overdrive unit. Refit the drain plugs.

Disconnect the propellor shaft at the overdrive end only and slide the end back to clear.

Remove the two (2) rear mounting bolts and disconnect the speedometer drive.

Turn the fan blades of the engine to the horizontal position (to avoid breakage when lifting) then lift and support the engine and gearbox sufficiently only to allow the overdrive unit to be withdrawn. Remove the nuts at Joint 'A' (Fig.75) securing the overdrive to the gearbox and manoeuvre the unit clear of the car.

To refit an overdrive unit, reverse the above procedure, ensuring that the input shaft splines mesh correctly in the reverse gear.

Stripping and Rebuilding the Overdrive

Removing and Refitting the Oil Pump

(Figs. 81, 82 & 83.)

Remove the solenoid bracket as previously described and lift out the accumulator spring and tube to give access to the oil pump non-return valve. Remove the oil pump non-return valve plug (A) spring, (B) plunger (C) and ball (D). Remove the drain plug (E). Remove the filter bolt (F) and the oil filter (G). Take out the plug (H) from the oil pump body and remove the two small screws. Using the oil pump extractor tool (Churchill L.183) screw the extractor bolt into the oil pump body in place of the removed screwed plug. Turn on the wing nut which will withdraw the pump body.

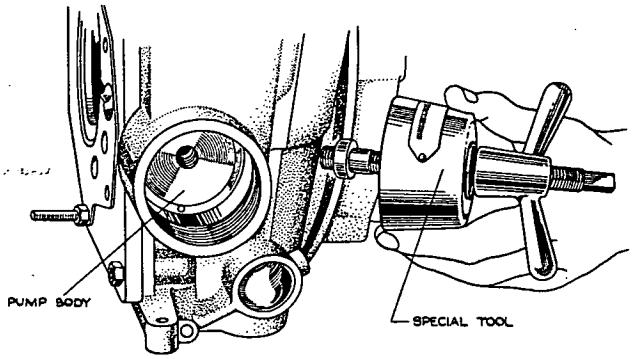


Fig. 82. Extracting the pump body from the casing using special tool Churchill L183

To replace the oil pump body which is an interference fit in the casing use two (2) number 10 UNF Studs about 3" long as guides (to locate the screw holes) and drive the pump body home with a suitable brass drift or use special tool (Churchill L.184) which incorporates the two guides.

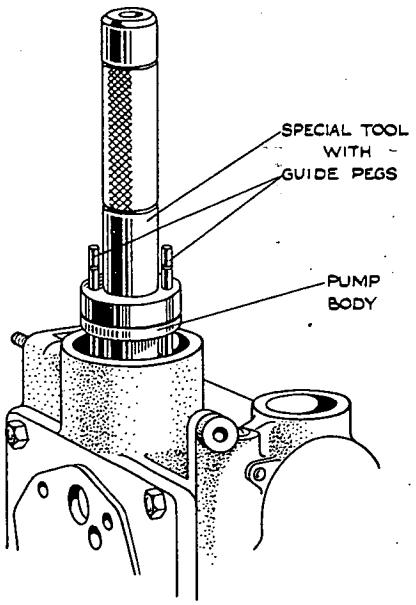


Fig. 83. Fitting the oil pump body using Churchill tool L184

The pump plunger is prevented from rotation, when in position, by a guide peg in the front casing. It is possible to guide it past the guide peg by means of a screwdriver inserted through the side of the casing.

Removing and Refitting the Accumulator Piston and its Housing

Remove the solenoid bracket as previously described and lift out the accumulator spring and spring tube. The accumulator piston housing is a push fit into the unit casing and the oil tightness of the housing is ensured by the two rubber rings.

The housing can be extracted easily together with the piston by the use of a special tool which fits into the bore of the housing and has a rubber ring which can be expanded by turning the tommy bar.

To use the extractor first remove the operating valve plug (Fig.80) to admit air to the rear of the housing, insert the nose of the extractor as far as it will go into the bore of the housing, tighten the tommy bar and pull (Fig.84)

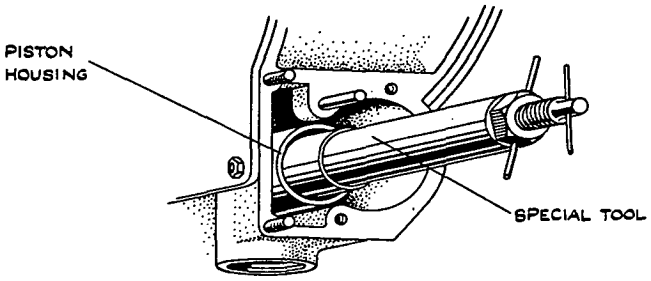


Fig. 84. Withdrawing the piston housing showing extractor tool Churchill L182 in position

Examine the bore of the housing for signs of wear such as a ridge or scoring. This examination should be carried out without removing the piston from the housing.

The accumulator piston is fitted into the housing with a special venturi tube (Churchill L.179) to ensure that the piston rings do not scrape as they enter the aluminium housing. Therefore do not remove the piston from the housing unless it is considered necessary. Should the piston be removed with no venturi tool available to insert it then it should be inserted at the front of the housing using a small piston ring clamp to compress the rings as the piston enters.

To reassemble the housing and piston assembly into the casing use either the withdrawal tool or push on the inner piston otherwise this piston may blow out backwards as the housing goes into the casing.

Dismantling the Body and Gears

First remove the adaptor casting which connects the overdrive unit to the 'Bristol' Gearbox. It will be noted that this is bolted together by four (4) short studs and two (2) long studs. Remove the nuts and washers from the short studs before touching the long studs. The nuts on the long studs should then be unscrewed simultaneously a few turns on each to release the compression on the inner clutch return springs.

Lift the clutch thrust springs from the supporting studs. Next remove the nuts from the six studs which hold the casings together and the front casing and rear casing can then be separated. Note the two (2) thrust washers between the bush in the front casing and the sun wheel splined extension.

Remove the bridge pieces from the front of the operating pistons and withdraw the cone clutch.

Withdraw the two (2) operating pistons.

Remove the small circlip securing the ball bearing to the cone clutch extension and remove the cone clutch from the ball bearing and Thrust Ring assembly.

Remove the larger circlip retaining the ball bearing in the Thrust Ring assembly and press out the bearing.

Using a hide faced hammer tap evenly around the cast iron brake ring and remove.

The removal of the solenoid cover and valves has been dealt with previously in the fault finding.

Sun Wheel, Planet Carrier and Uni-directional Clutch

Lift out the sun wheel and remove the thrust washers between the sun wheel and the planet carrier. Then remove the planet carrier.

Withdraw the un-directional clutch using the assembly ring (Churchill L.178) to retain the rollers and then lift out the thrust washers.

Dismantling Rear Casing and Annulus

Unscrew the set screw securing the speedometer drive bush and withdraw the bush and gear assembly.

Grip the coupling flange, withdraw the split pin and remove the slotted nut and washer. Withdraw the flange.

The annulus, which can now be drifted out easily from the rear will take the front ball bearing with it and leave the rear ball bearing in the casing.

Extract the rear ball bearing and the oil seal.

Inspection

Front Casing.

Examine for cracks or damage, oil leaks from the plugged ends of the oil passages or from the welch plug beneath the accumulator bore. Examine the bronze support bushes in the centre bore in which the input shaft should be a close running fit. See that the operating piston bores are free from scratches or scoring and at the same time check that the operating pistons and rings are not damaged.

The Gears

Inspect the teeth of the gears for damage. Examine the bronze bush in the sun wheel which should be a close running fit on the mainshaft, and examine the planet wheels which should be a close running fit on the planet pinions.

Cone Clutch Sliding Member Assembly

Examine the clutch linings for burning, wear or embedded foreign matter. See also that the cone clutch slides freely on the splines of the sun wheel extension. Make sure that the pins for the clutch springs and bridge pieces are rivetted tightly into the clutch thrust ring and that the thrust ring ball bearing is in good condition.

Clutch Springs

Examine for distortion or collapse. Free length of the outer springs should be 4.1/2 inches and the free length of the inner springs 4.1/4 inches. Replacement springs are supplied in sets.

Uni-directional Clutch

See that the rollers are not chipped or damaged and that the inner and outer members of the roller clutch are not damaged. See that the spring is not distorted or broken.

Replacement rollers are supplied in sets.

Ball Bearings

See that the ball bearings for the annulus are in good condition and free from any roughness when rotating slowly.

All Thrust Washers

Inspect for scoring.

Oil Pump

Examine the pump for signs of wear. The pump plunger should be a close sliding hydraulic fit in the pump body and the plunger roller should rotate freely on the roller pin with no slackness. Examine that the pump valve seat and ball are free from nicks and scratches.

Operating Valve

See that the ball seating and ball are free from nicks and scratches and the restrictor jet clear. Make sure that the valve slides freely in its bore in the front casing.

Re-assembly of Overdrive Unit

First build up the Rear Case assembly.

Drive the front ball bearing on the annulus and then press the annulus right home in the rear casing.

A selective spacing washer must now be fitted which should give an end float of .005 inch to .010 inch (see Fig.85). When a suitable washer has been decided upon fit this to the shaft, drive on the coupling, fit and tighten the slotted nut. The end float of the annulus must now be measured preferably with a dial indicator or measured from the face of the front casing to the face of the annulus. It is very important that no pre-load should develop on the annulus bearings when the unit warms up in use. If the end float does not conform to the correct limits, the slotted nut and coupling flange must be removed and another spacing washer selected. When the end float is correct remove the nut and flange and press home the oil seal with the lip of the seal inwards. Finally press on the coupling flange, tighten the slotted nut and lock with split pin.

ASSEMBLE THE FRONT CASING in the following order:

Assemble the oil pump with valve etc., the accumulator housing with piston, accumulator spring, tube and solenoid bracket as previously described.

Next fit the two operating pistons using a small piston ring clasp to assist assembly or special tool (Churchill L.179). The operating ball valve, plunger, spring and plug should now be fitted.

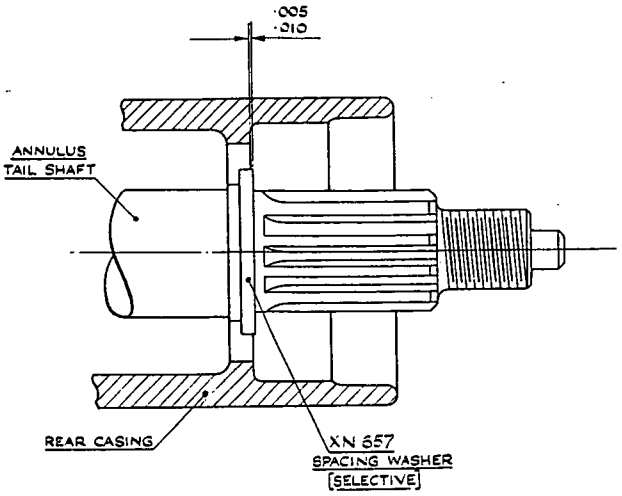


Fig. 85. Selection of washer for annulus end float

Finally drive home the cast iron brake ring using a hide hammer (Fig.86). The brake ring is spigotted to the main casing and is a light interference fit.

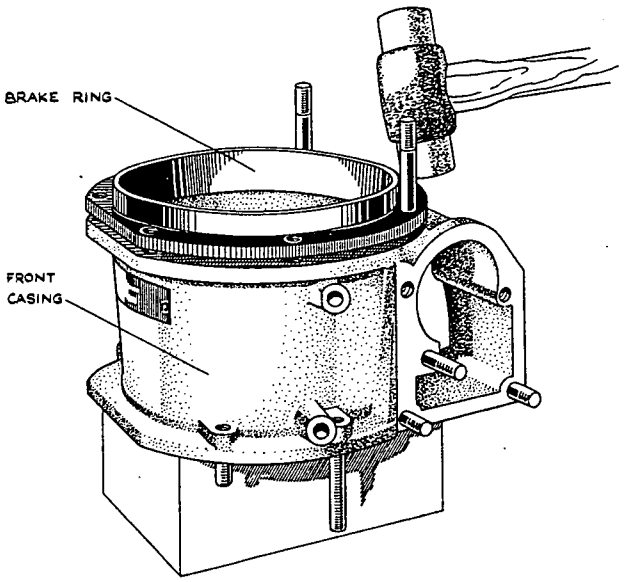


Fig. 86. Fitting the brake ring

THE SLIDING CLUTCH MEMBER should now be assembled.

Press the ball bearing into the housing in the thrust ring and secure with the external circlip. The thrust ring and bearing is then pressed on to the cone clutch member and secured with the internal circlip.

Assemble the Uni-directional Clutch

Fit the spring and centre member of the clutch to the cage, locating the spring to cause the rollers (when fitted) to rise up the inclined face of the centre member.

Position the roller assembly ring (Churchill L.178)

to cage and inner members then feed the rollers into position (Fig.87). Mount the rear casing flange down-

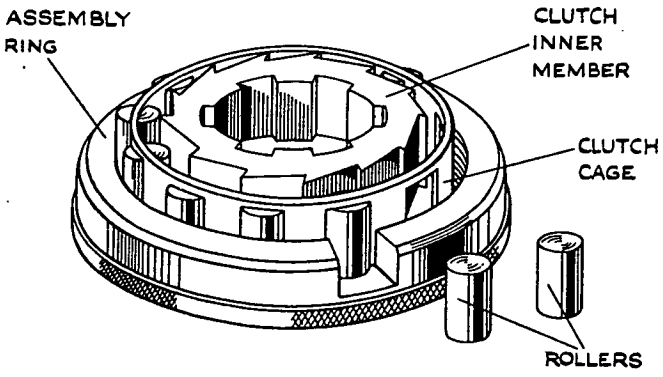


Fig. 87. Assembly of uni-directional roller clutch in assembly ring Churchill L178

wards in a suitable support. Fit the correct washer to the recess in the annulus. With assembly ring still in position to retain the rollers, fit the uni-directional clutch (open side of the cage inwards) to the annulus (Fig.88) and withdraw the assembly ring.

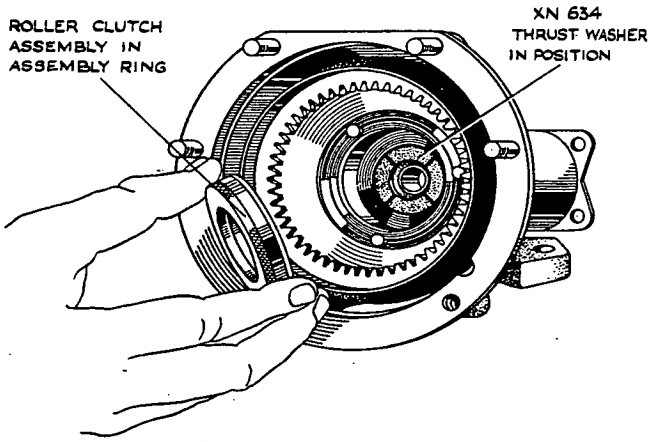


Fig. 88. Fitting uni-directional roller clutch to annulus

Assembly of Gears

With the rear casing held vertically by its coupling flange.

Place the three thrust washers for the rear of the sun wheel into position inside the planet carrier with the steel thrust washer between the two bronze ones.

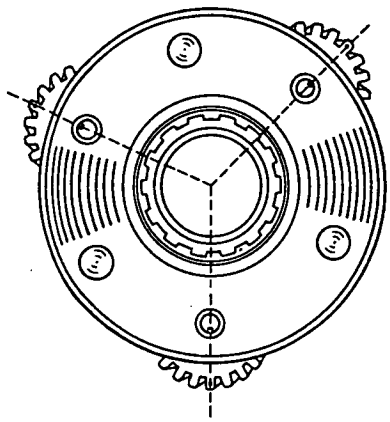


Fig. 89. Positioning the punch marks on the planet wheels

One tooth on each planet wheel is centre punch marked and the planet wheels should rotate in the carrier so that the punch marks are radially outwards as shown in Fig. 89. The sun wheel should now be inserted into the planet carrier and, with the punch marks still outward, the planet carrier should be placed into the annulus.

A dummy input shaft (Churchill Tool No.185) should now be inserted and left in place until the assembly is completed.

The next operation is to determine the correct amount of end float for the sun wheel which must be between .014 inch and .020 inch.

Place the bronze thrust washer (fixed size) over the dummy input shaft. A steel washer (selective) which is fitted between the bronze thrust washers and the central bush in the main casing serves also to make this adjustment and is supplied in seven thicknesses to suit the assembly.

Gauging the end float of the sun wheel can be carried out with feeler gauges using the following procedure.

With the bronze thrust washer and a steel thrust washer in position on the dummy input shaft and locating on the face of the sun wheel extension, place another steel washer of known thickness on the shaft (Fig.90).

The cone clutch assembly should be left out while the thrust washer is being selected.

Locate the front casing on the shaft and press down on the face of the thrust washers. The faces will not join because of the gap made by the additional (known size) thrust washer and the distance between the two casings should be measured with feeler gauges.

The width of the gap subtracted from the thickness of the known washer will give the amount of end float when that particular washer is removed. If the end float is found to be too much or too little a suitable washer from

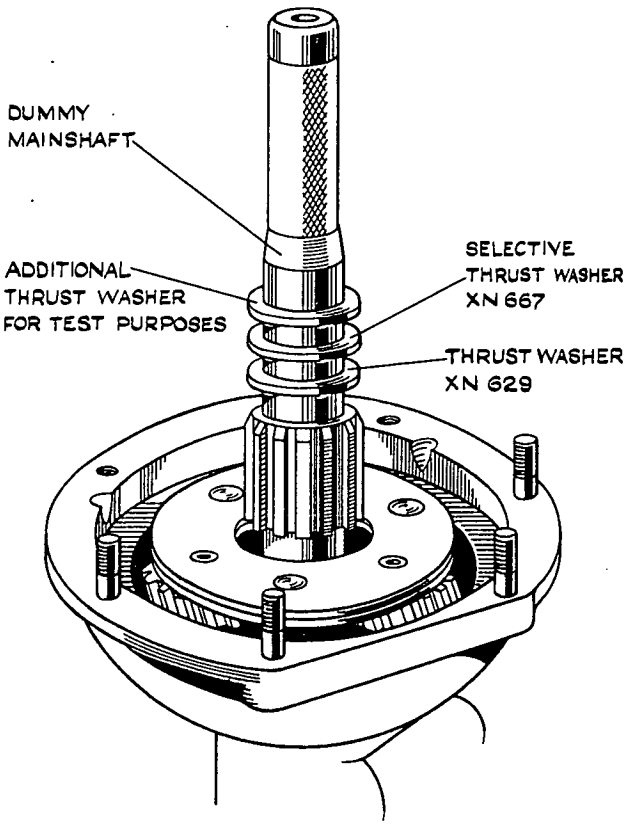


Fig. 90. Selecting a suitable thrust washer for sun wheel end float

the seven (7) selective sizes can be determined by calculation.

When the end float of the sun wheel has been determined the assembly can be completed.

Fit the cone clutch assembly into the front casing, join the two casings together, fit the spring washers and nuts on to the studs and tighten evenly.

The bridge pieces for the operating pistons can now be positioned with tabwashers and nuts and tightened and locked with the tabwashers.

The clutch springs should now be positioned with the four (4) longer springs on the outside pegs and the four (4) shorter ones on the inside pegs.

Fit a paper joint to the front face of the front casing and fit the adaptor casting over the studs. Locate the clutch springs on to their respective spigots on the inside face of the casting.

Tighten the adaptor casting by screwing down the nuts evenly on the two longest studs and finally tighten by means of the four (4) remaining studs.

The overdrive unit is then ready for use or if for storage the front face should be covered.

The assembly of the input shaft is selective to each gearbox and is covered by its own procedure previously given.

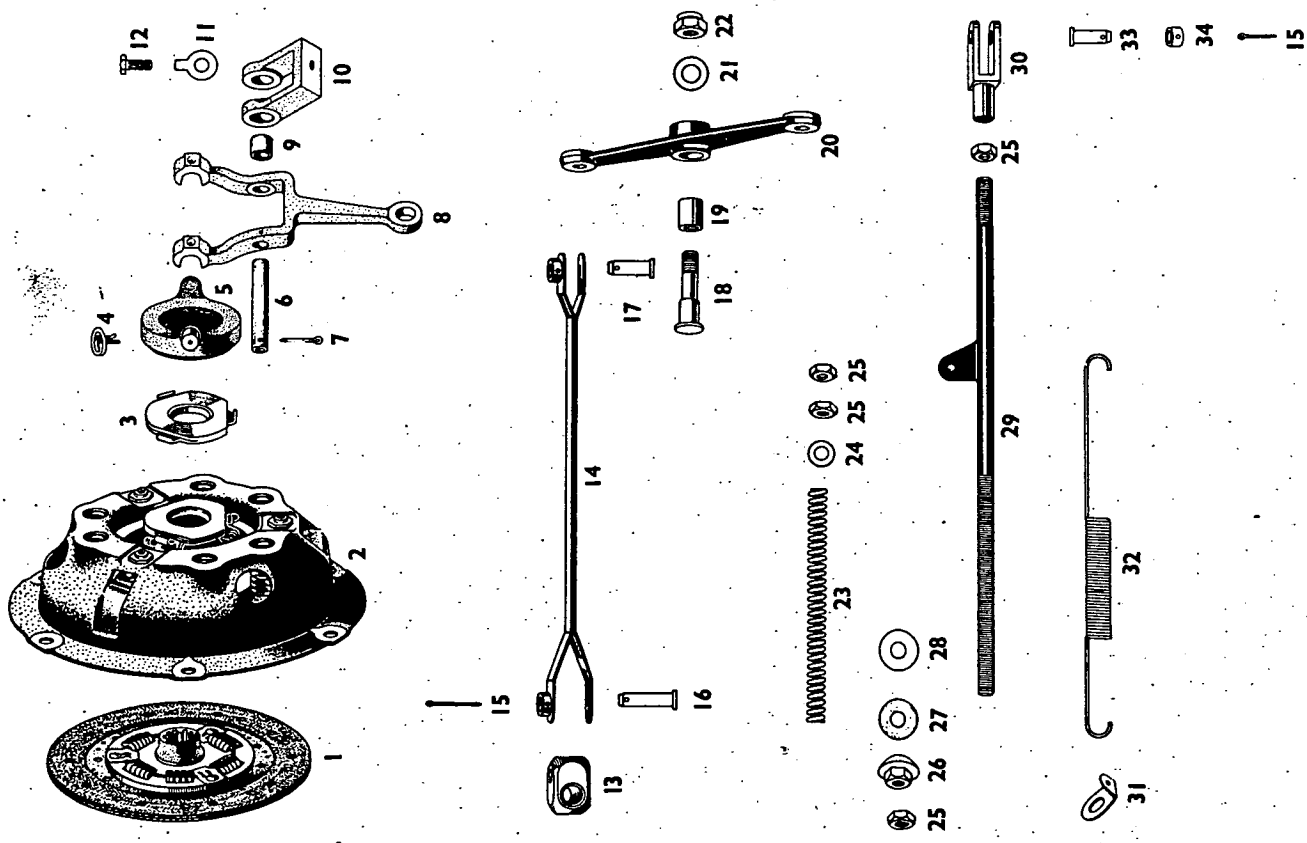
Clutch and Clutch Adjustment

List of Contents

Clutch and Clutch Adjustment

CLUTCH AND CLUTCH ADJUSTMENT.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.440910	1	Driven Plate Borg & Beck 47625/39	1	N.470581	19	Bearing	1
N.440940	2	Clutch Cover Assembly. Borg & Beck 45688/37	1	N.470501	20	Rocking Lever	1
N.440100	3	Release Lever Plate Borg & Beck 44930	1	N.470841	-	Rocking Lever (Type 404 LHD only)	-
N.440200	4	Release Bearing Retainer Borg & Beck 41628	2	-	21	Plain Washer 3/8" dia.	1
N.440490	5	Release Bearing & Cup Assy Borg & Beck 46892	1	NPF/124/10B	22	Simmonds Pinnacle Nut	1
N.440310	6	Fulcrum Pin	1	N.470491	23	Spring	1
ND	7	Split Pin 3/32" dia. x 1¼" long	1	-	24	Plain Washer 5/16" dia.	1
N.440291	8	Clutch Operating Lever	1	FN205/L	25	Locknut	4
N.440300	9	Bush	1	N.471161	26	Spherical Bearing	1
N.440970	10	Fulcrum Block with Bushes	1	N.471181	27	Leather Washer	1
N.310900	11	Tabwasher	1	N.471171	28	Washer	1
FS.105/7D	12	Setscrew	1	N.471131	29	Operating Rod (Type 404 Cars)	1
N.470341	13	Trunnion Block	1	405-1-24011	-	Operating Rod (Type 405 Cars)	1
N.471111	14	Connecting Link (Type 404 Cars)	1	N.470571	30	Fork End	1
405-1-24010	-	Connecting Link (Type 405 Cars)	1	N.620321	31	Return Spring	1
ND	15	Split Pin 3/32" dia. x 1" long	3	N.620331	32	Tabwasher - Clutch Spring	1
SP.4/F16	16	Steel Pin	1	SP4/F/10	33	Steel Pin	1
SP.4/F7	17	Steel Pin	1	AGS.899/6	34	Collar	1
N.471151-	18	Swivel Pin	1				



Clutch and Clutch Adjustment

Type and Description

Borg & Beck 8 inch dry plate, with carbon release bearing.

Clutch Cover Assembly.....Borg & Beck 45688/37
8 inch Driven Plate.....Borg & Beck 47625/39
Release Bearing & Cup Assy..Borg & Beck 46892

Replacements

Where possible every use should be made of the Borg & Beck replacement service which is available for the clutch cover assembly and also the driven plate.

If a replacement driven plate is to be fitted, check its fit on the splines of the gearbox drive shaft in every position of spline engagement. A free sliding fit without slackness is essential.

Removing the Clutch

Remove the gearbox as described in that section.

Referring to Fig.91 remove three only of the six screws attaching the clutch cover to the flywheel leaving the remaining three screws equally spaced. Then slacken the remaining screws progressively to relieve the pressure of the clutch springs.

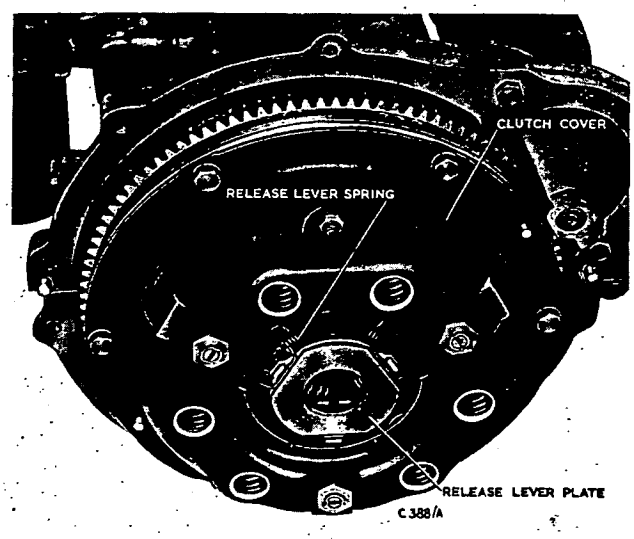


Fig. 91. Clutch unit in position on flywheel

Remove the clutch cover and its driven plate.

To Fit a Replacement Clutch

Before fitting a replacement clutch check that the flywheel face is in good condition. Should it require attention refer to the engine section for grinding the face.

With the flywheel face perfectly clean, place the driven plate against the face with the shorter side of the splined hub towards the engine, centralise and retain it by using a stepped mandrel locating in the bore of the bearing in the rear of the crankshaft and the hub of the driven plate. Failure to centralise the driven plate correctly will result in damage when the gearbox driving shaft is entered.

Fit the clutch cover to the flywheel, aligning the dowel holes with the dowels in the flywheel. Fit the six bolts and spring washers and working diagonally tighten each bolt evenly, finally tightening to a torque loading figure of 10 lb.ft. (+2 lb.ft.)

Withdraw the mandrel. Examine the carbon release block in the clutch housing of the gearbox Fig. 92 and if necessary replace. It is held in position by two retainer springs.

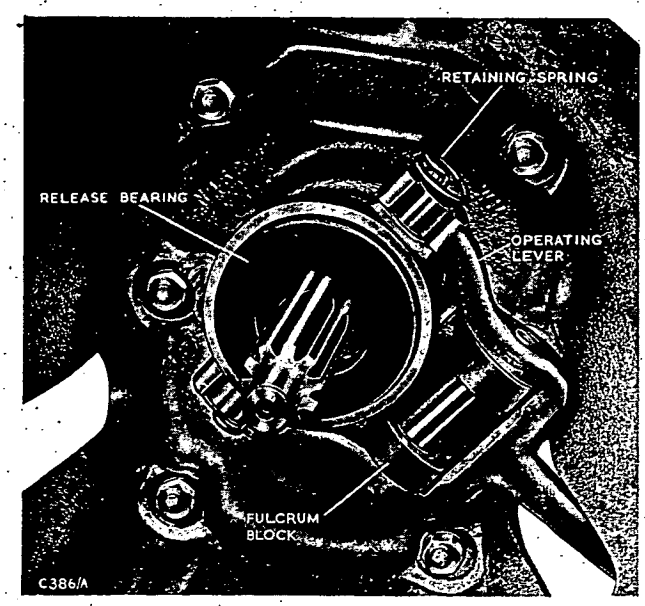


Fig. 92. Clutch release bearing (L.H. drive)

Fit the gearbox and finally adjust the clutch.

Clutch Adjustment

The clutch should normally give satisfactory service for long periods without adjustment.

However 'free' travel is very necessary and this should be maintained at 1 inch (25.4 m/m) measured between the pedal pad and the toeboard.

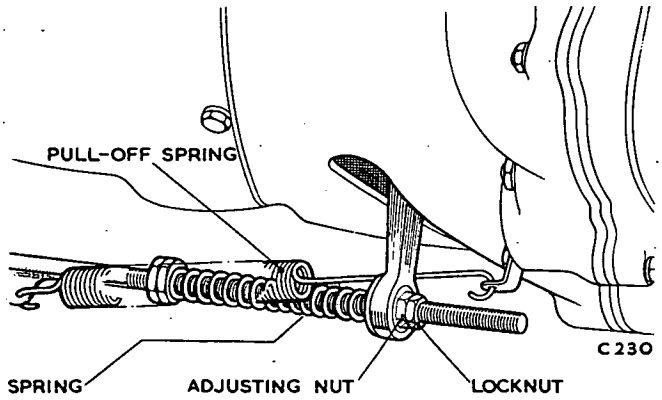


Fig. 93. Clutch operating lever

Adjustment can be made by means of the spherically-seated adjusting nut on the forward end of the clutch operating lever Fig. 93

The location of this adjustment is readily seen from beneath the bonnet on the drivers side but it is advisable to adjust from beneath the car as shown in Fig. 94.

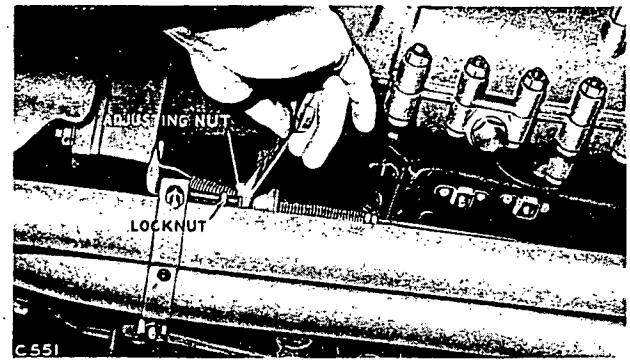


Fig. 94. Adjusting clutch

To adjust the travel slacken the locknut and turn the adjusting nut until the correct 'free' travel is obtained at the pedal pad, then tighten the locknut.

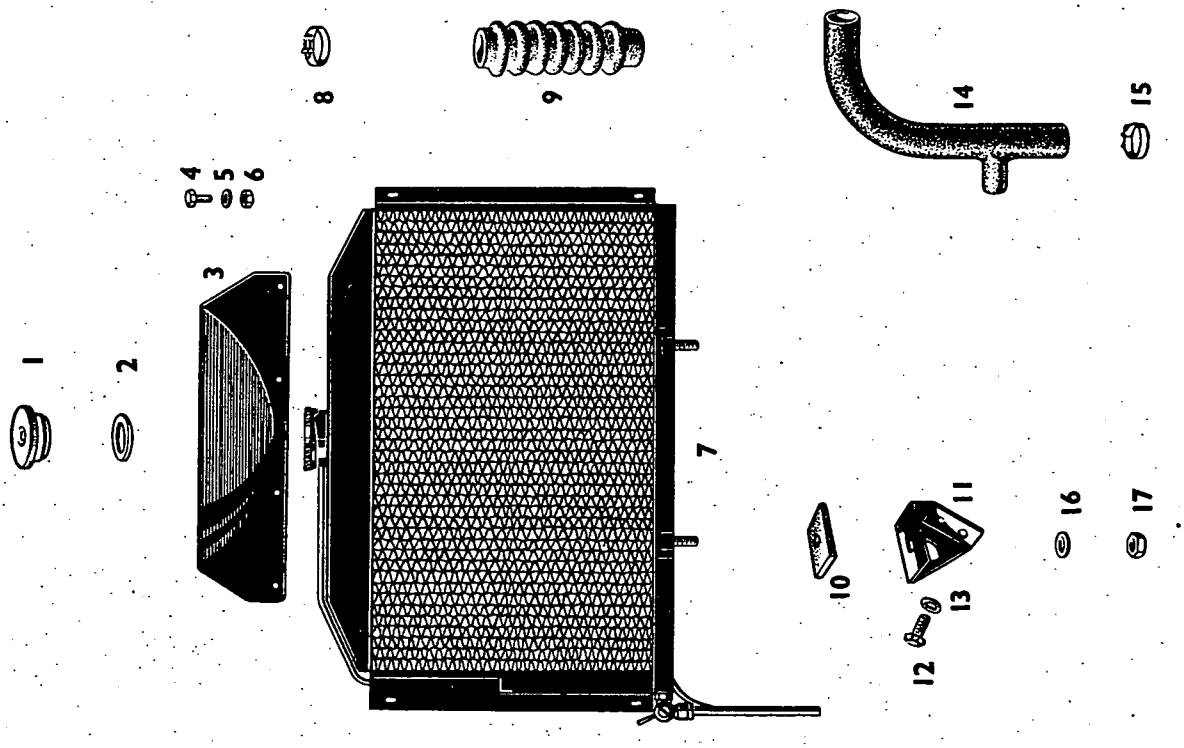
Engine Cooling System

List of Contents

Engine Cooling System

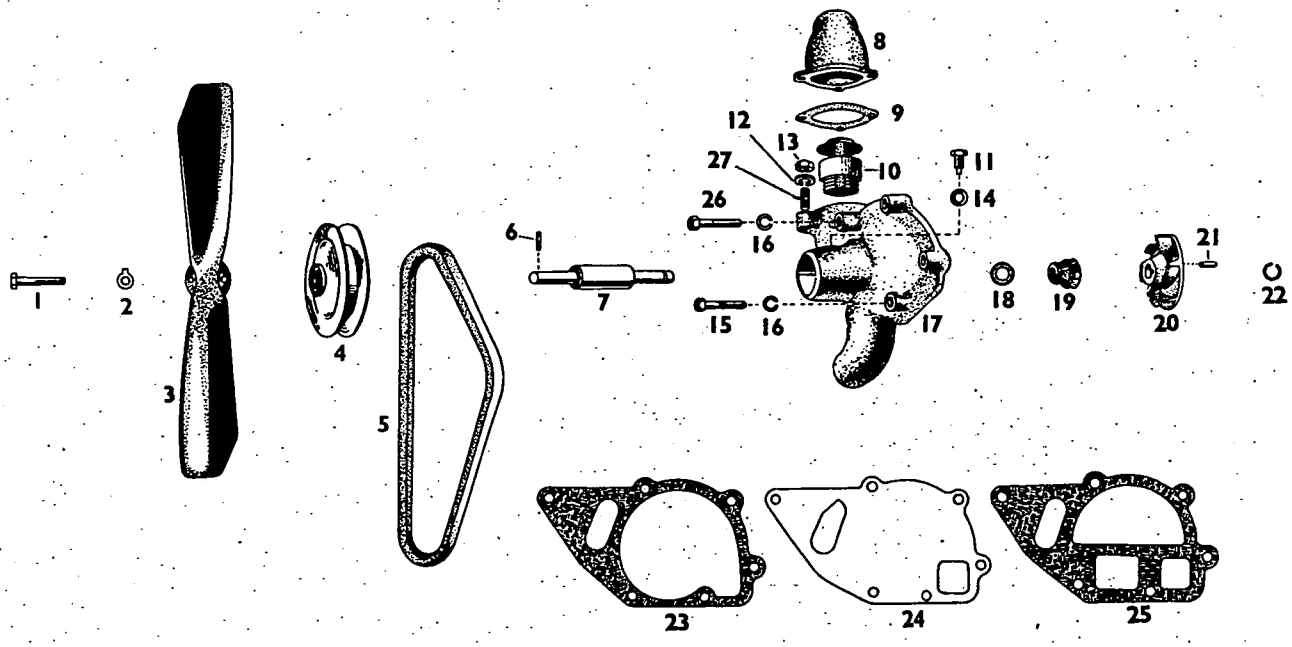
RADIATOR.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
405-1-20154	1	Filler Cap	1	404-II-20160	11	Radiator. Support Bracket LH.	1
404-1-20155	2	Filler Cap Washer	1	404-II-20161	-	Radiator Support Bracket RH.	1
405-1-20156	3	Fan Guard	1	FS105/4D	12	5/16" BSF Setscrew	4
FS. 104/4R	4	Screw ¼" BSF Hex Head ½" long	4	-	13	5/16" Shakeproof Washer	4
-	5	Shakeproof Washer ¼" dia.	4	405-1-20025	14	Radiator Hose - Bottom - Long Return	1
FN104/A	6	Nut ¼" BSF	4	405-1-20026	-	Radiator Hose - Bottom - Short Return	-
405-1-20157	7	Radiator Assy.	1	N. 410081	15	Clip - Bottom Hose	2
N. 704172	8	Clip - Top Hose	2	-	16	7/16" Plain M.S. Washer.	2
404-1-20118	9	Radiator Hose - Top	1	-	17	7/16" BSF Simmonds Nut	2
N. 410021	10	Rubber Pad	2				



WATER PUMP GROUP

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
WB. 104/8D	1	Bolt - Fan	2	FB. 105/14D	15	Bolt 5/16" BSF 1¼" long	5
N. 350120	2	Tabwasher - Fan (Also N. 350990)	2	AGS. 585/E	16	5/16" Spring Washer	6
N. 350610	3	Fan	1	N. 350460	17	Water Pump Casing	1
N. 350680	4	Fan Pulley	1	N 350690	18	Thrower	1
N. 350640	5	Belt	1	N. 350410	19	Oil Seal	1
N. 350580	6	Locating Pin	1	N. 350470	20	Impellor	1
N. 350710	7	Water Pump Shaft	1	N. 350540	21	Locking Dowel - Impellor	1
N. 350620	8	Outlet Pipe	1	N. 350700	22	Circlip - Shaft	1
N. 350630	9	Joint - Outlet Pipe	1	N. 350250	23	Water - Pump	1
N. 350780	10	Thermostat	1	N. 350230	24	Blanking Plate	1
N. 350490	11	Bearing Retaining Screw	1	N. 350240	25	Washer - Head	1
AGS. 585/D	12	Spring Washer	3	FB. 105/19D	26	Bolt 5/16" BSF. x 2.3/8" long	1
FN. 104/K	13	Nut - Outlet Pipe	3	N. 453120	27	Stud	3
	14	5/16" Dia. Washer	1				



Radiator

Description

The cooling system of the Type 404 and 405 cars is similar.

Water drawn from the radiator, by the centrifugal pump mounted on the front of the cylinder head, is impelled around the inlet valve seats into the cylinder block jacket. The return flow passes around the exhaust valve seats to the pump and finally to the radiator via a thermostat valve incorporated into the pump.

The radiator is of the cellular matrix type, the system being sealed with a steam pressure relief valve incorporated in the filler cap.

The thermometer bulb of the water temperature gauge is located on the right hand side of the cylinder block.

The thermostat valve in the water pump operates in the following manner. When the engine is cold the valve seals the outlet to the radiator. Water is then circulated through the cylinder block and head, enters the valve housing and passes to the impellor to be re-circulated. A small bleed hole in the valve head prevents excessive water pressure. As the water temperature reaches 75° C (167° F) the valve is lifted from its seat permitting a flow via the outlet elbow to the radiator header tank.

At normal running temperature the valve is fully open and full water circulation operates. This system promotes the rapid warming of the engine in cold weather.

Draining the System

Warning. Never remove the radiator cap while the engine is running since water may be ejected through the filler neck under pump pressure. After stopping a hot engine remove the cap slowly to release any steam pressure.

To drain the system, ease the radiator cap and open the taps at the bottom right hand side of the radiator and on the rear left hand side of the cylinder block. No tap is provided for the heater system since this is at the highest point.

Flushing

Flush the system at intervals depending upon the local water conditions and the type of operation to which the car is subjected. Always flush the system after the removal of water containing anti-freeze compound or if the car has been standing for a considerable period with the cooling system empty.

Any proprietary brand of flushing solution may be used provided that it is not harmful to aluminium.

Removing and Refitting the Radiator

Remove the bonnet, drain the system and disconnect the radiator hoses. Remove the two bolts on either side at the top of the radiator and remove the angle clamping plate and the rubber packing. Fig. 95

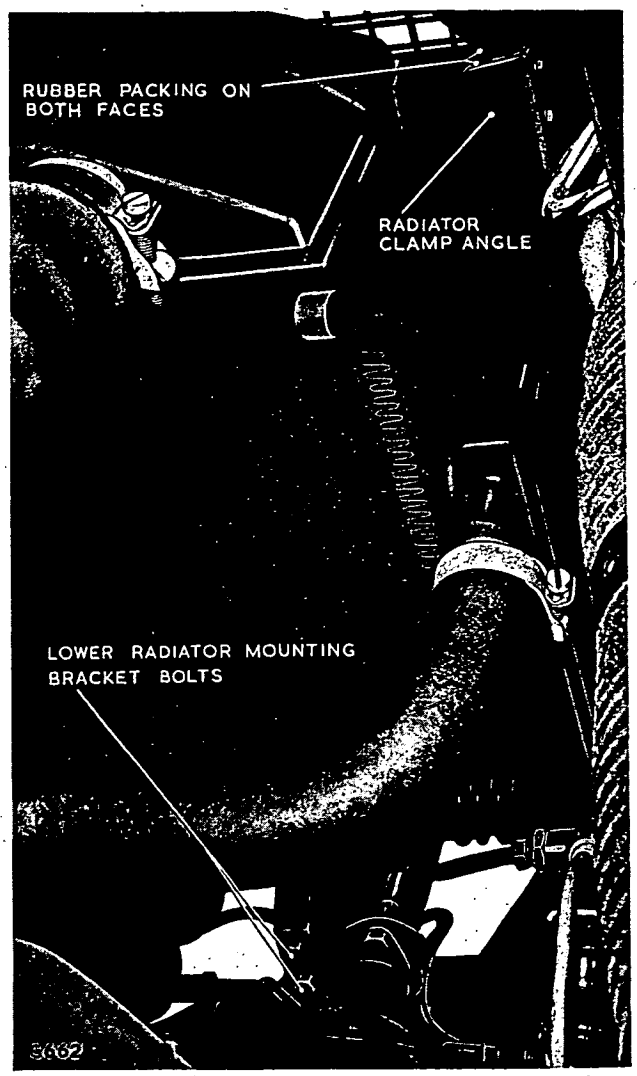


Fig. 95. Radiator attachment points

Remove the two bolts on either side securing the lower radiator mounting brackets and lift the radiator out complete with the brackets.

Note. The lower mounting brackets and rubber mounting blocks are parts of the car and not parts of the radiator. They are detached with the radiator for ease of removal only. If a replacement radiator is to be fitted transfer these parts from the removed radiator.

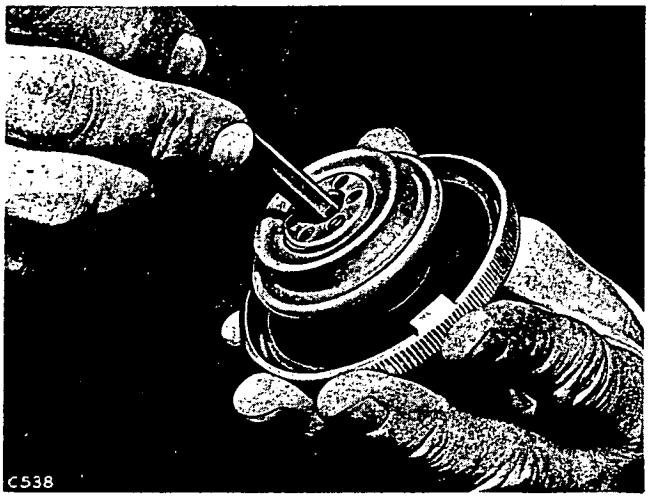


Fig 96. Checking radiator pressure release and overflow valve

To refit the radiator reverse the removal procedure.

Radiator Cap

Incorporated in the radiator cap is a steam pressure release and overflow valve. It is advisable to check periodically that the spring loaded valve is free by pressing it open through the hole in the centre of the cap as shown in Fig. 96.

Fan Belt Tension

The belt is tensioned correctly if it can be deflected inwards by hand approximately 1 inch on its upward run. If the belt is slack, release the dynamo adjusting and mounting bolts as shown at A, B and C in Fig.11 together with the mounting bolt located at the rear of the dynamo.

Note. A suppressor mounting bracket is secured to the rear dynamo bolt when radio is installed.

Move the dynamo away from the cylinder block to obtain the correct tension and tighten the attachments.

Water Pump

Replacements

Service replacement Water Pumps are available from the manufacturer. They are supplied subject to the return of the removed water pump which is accepted for normal wear and corrosion only.

It should be noted that replacement pumps are supplied without the fan and with the two lower bolts in position. If needed order the two joint washers and the two tab-washers for the fan when replacing a pump.

Removing the Water Pump

Ease the radiator cap and drain the radiator and block.

Disconnect the radiator hoses from the pump.

Slacken the dynamo belt adjustment and mounting bolts, press the dynamo towards the engine as far as possible and detach the belt.

Release the six bolts securing the pump to the cylinder head and remove the pump complete with its blanking plate and joint washers.

The two lower bolts of the pump cannot be withdrawn because of the pulley. See Replacements.

Dismantling

Detach the fan by unlocking the tabwashers and removing the two bolts.

Tap out the 1/8 inch dia. parallel pin securing the pulley to the pump spindle and detach the pulley using the extractor T.186444 (Fig. 97).

Cut the locking wire and remove the bearing retaining screw and washer. Press or drive the spindle and bearing assembly complete with impellor from the body

It will be noted that the impellor spindle retaining circlip and vertical dowel are rusted together and it would be preferable to stand this end in a 'freeing' solution.

The circlip should be removed, the oil seal broken away, to allow support for the impellor, and the spindle pressed or driven from the impellor.

Withdraw the rubber thrower from the spindle. Remove the three nuts and washers and detach the outlet elbow with its joint washer.

Lift out the thermostat.

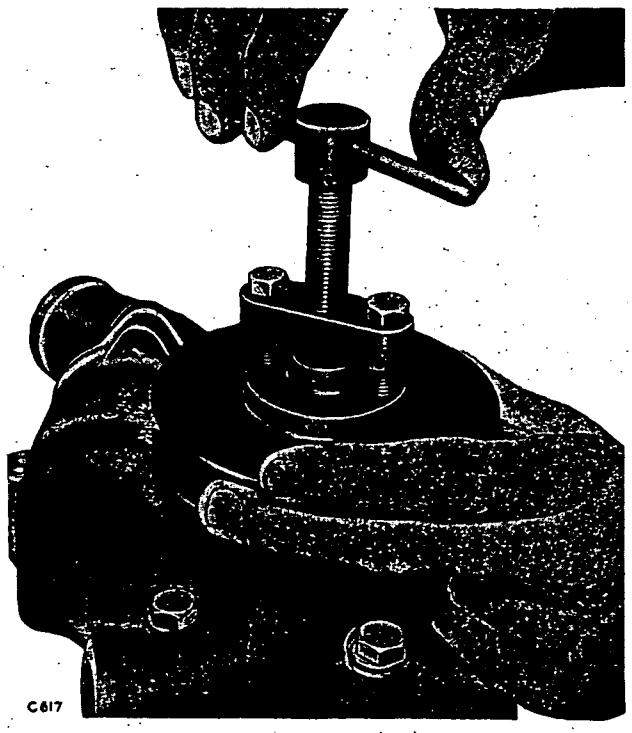


Fig. 97. Removing water pump pulley

Reconditioning

Pump Body

Clean out all water passages and the impellor chamber, removing all corrosion. This is best carried out by sand blasting the whole pump except the spindle bore.

Corrosion can be very extensive but if the aperture and bolt holes have not been penetrated, see Fig. 98 then the body is usually good enough for further use. If the aperture and holes have been penetrated a portion of the material should be cut away to give some thickness and the wall should be built up by welding, using a Aluminium Silicon Rod (7% Silicon).

Surplus weld should then be filed away back to the original face.

Irrespective of whether welding has taken place the locating face should be filed and finally lapped until flat removing the minimum amount to maintain the correct clearance with the impellor.

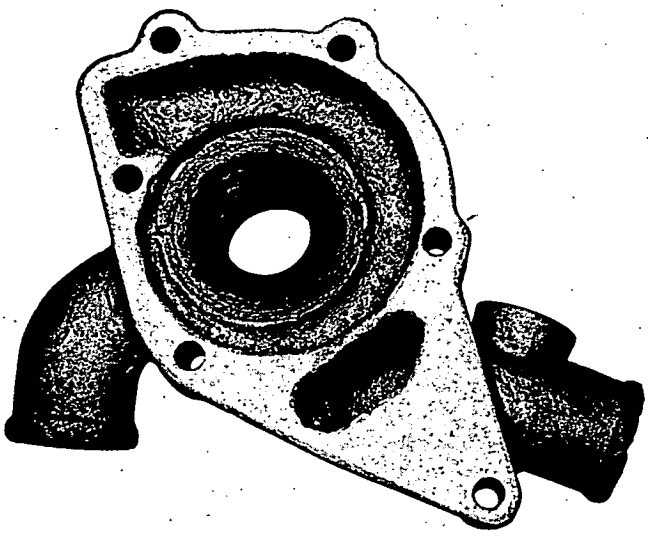


Fig. 98. Water pump body corrosion

Impellor

The seal face should be carefully lapped to give a smooth finish.

Spindle and Bearing Assembly

Remove any corrosion from the spindle using fine grade emery cloth and paraffin.

This assembly is a complete unit and cannot be separated. If the bearings are excessively worn fit a new assembly.

Thermostat

If the bellows are punctured, this will be indicated by the entry of water, discard as unserviceable.

Ease the valve of its seat by pressing the outer bellows rim upwards Fig. 99 and check that the valve returns to its seat on release of the pressure. If the movement is stiff and the assembly corroded, soak it in thin machine oil and carefully remove excessive corrosion to ease the valve action. Make sure that the valve seating and valve face are clean.

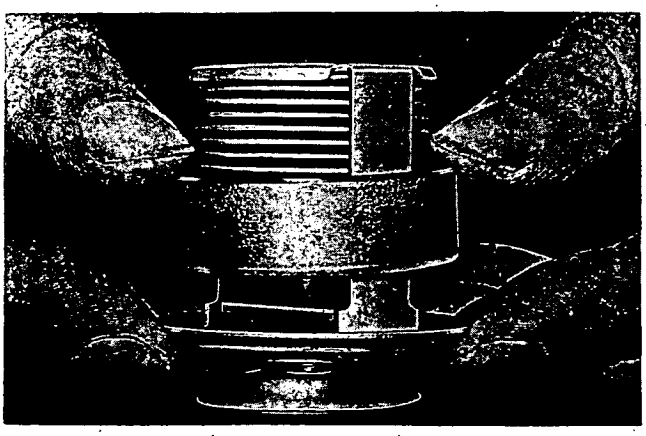


Fig. 99. Checking thermostat valve seat

To check the action of the bellows immerse into boiling water and the valve should lift clear of its seating.

Re-assembling

Immerse the pump body in boiling water and allow it to remain until heated throughout. Smear the external surface of the spindle bearing with grease. Remove the pump body from the water and locate it face downwards on a suitable fat surface.

Insert the spindle and bearing assembly, grooved end downwards and align the retaining screw hole in the bearing with the screw hole in the body.

Lightly drive the assembly into position using a hollow drift or tube locating on the outer edge of the bearing Fig. 100 until the retaining holes are in line.

Fig. 100. Inserting water pump bearing

Fit the retaining screw and washer and tighten securely.

At the impellor end fit the rubber thrower over the spindle and on to the face of the bearing.

Coat a new seal with anti-freezing rubber containing 'Dag' colloidal graphite and locate it carefully in the recess in the body, carbon face outermost.

Aligning the dowel hole of the impellor with the flat on the spindle drive on the impellor until the top face is level with the lower edge of the circlip groove. Do not drive the impellor beyond this point otherwise it will be difficult to withdraw. Insert the dowel.

Fit the impellor retaining circlip making sure that it fully seats in the groove.

Using feeler gauges check the clearances of the vanes and face of the impellor to the figures shown in Fig.101 Providing that the components are in a satisfactory condition these clearances are usually obtained.

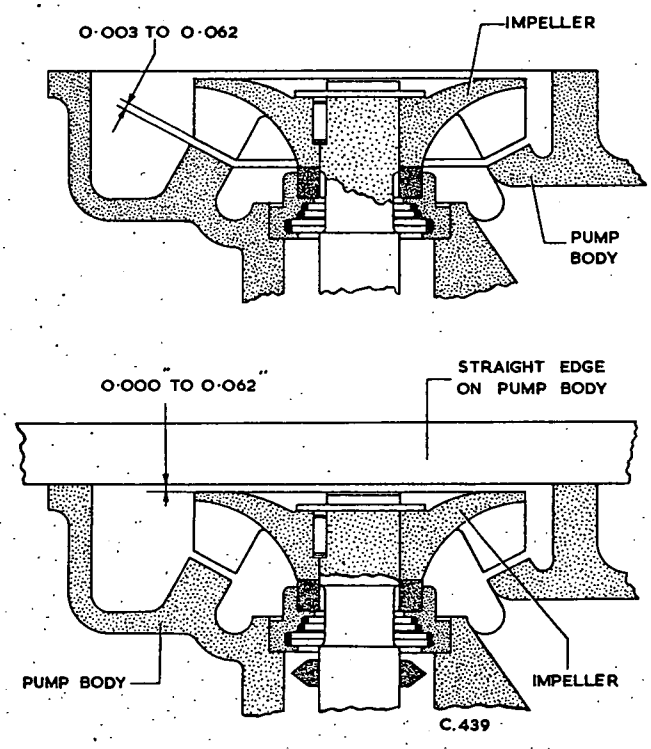


Fig. 101. Checking pump impellor clearances

When the clearances are satisfactory, tighten and wire-lock the bearing retaining screw.

Fit securing bolts and spring washers to the two lowest holes in the pump body. This is important since these cannot be fitted once the pulley is assembled.

Carefully mark the top of the spindle showing the location pin centres then fit the pulley to the pump spindle aligning the locating pin holes with the marking on the spindle. Fig.102. Support the other end of the spindle during this operation otherwise the pressure will be put on to the ball bearings and the bearing retaining pin. A noisy bearing can result from this.

Insert the locating pin.

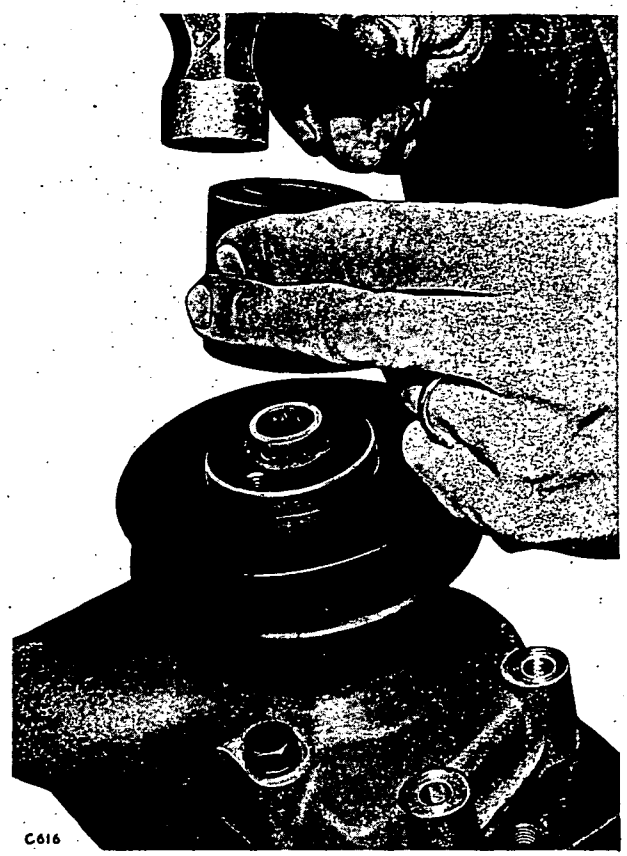


Fig. 102. Fitting water pump pulley

Fit the fan to the front of the pulley and secure it with the bolts and tabwashers.

Fit the thermostat Fig.103, positioning it so that the side pieces do not obstruct the transfer passage.

Lightly grease the outlet joint faces, fit a new joint and attach and secure the outlet elbow with its three nuts and spring washers.

Refitting Water Pump to Engine

See that the pump attachment face at the front of the cylinder head is clean and flat. Smear the face with grease and fit a new joint washer (Part No. N.350240).

Clean the blanking plate faces and check for flatness.

Grease the face of the pump body and fit a new joint washer (Part No. N.350250).

Smear the blanking plate with grease and assemble the pump to its location screwing in the two lower bolts, finger tight.

Fit the four remaining bolts and spring washers and tighten all bolts evenly.

Refit the fan belt and adjust to the correct tension.

Fit the radiator hoses and fill the cooling system.

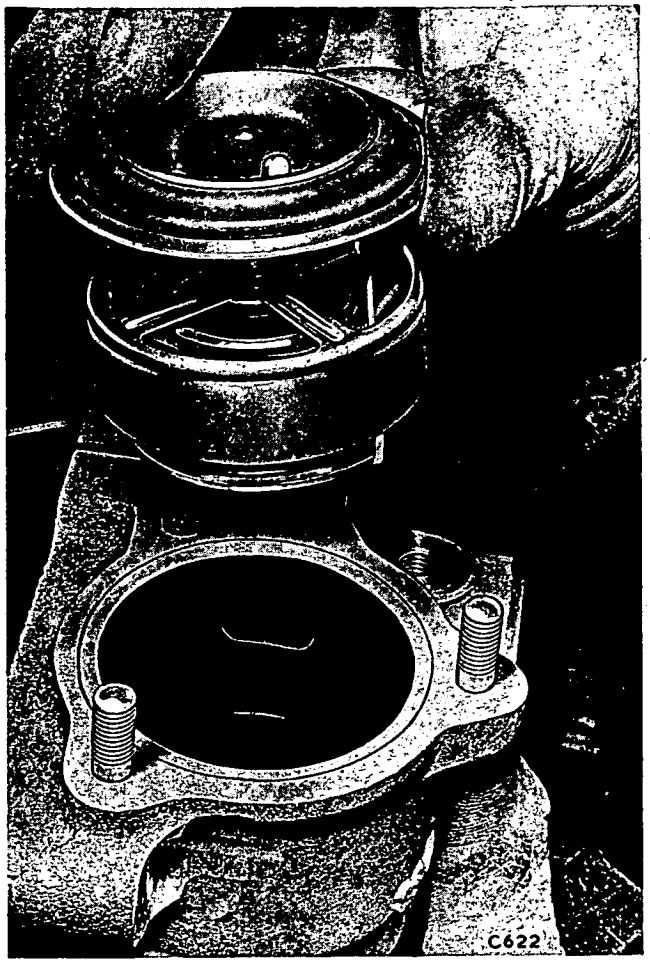


Fig. 103. Fitting thermostat to water pump

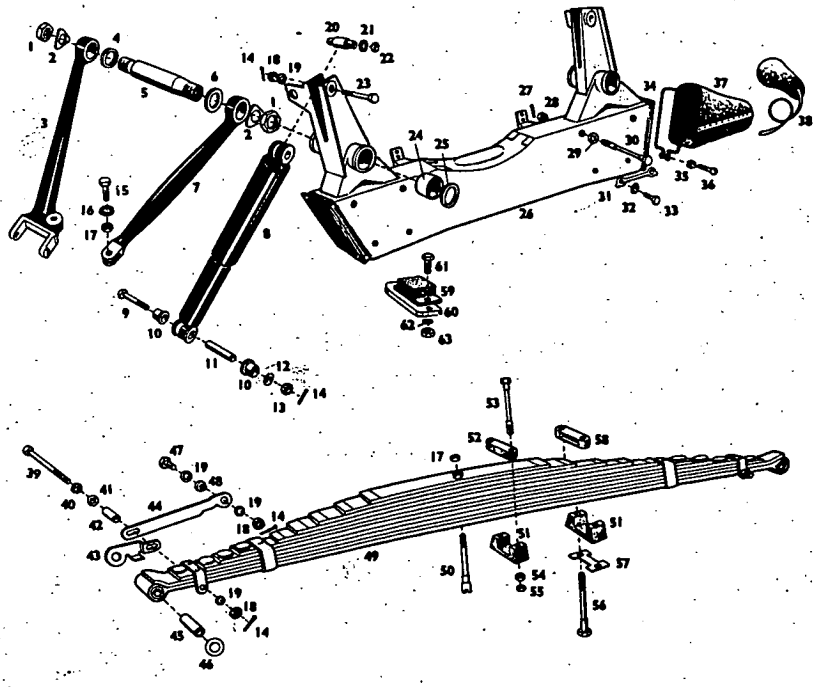
Front Suspension

List of Contents

Front Suspension

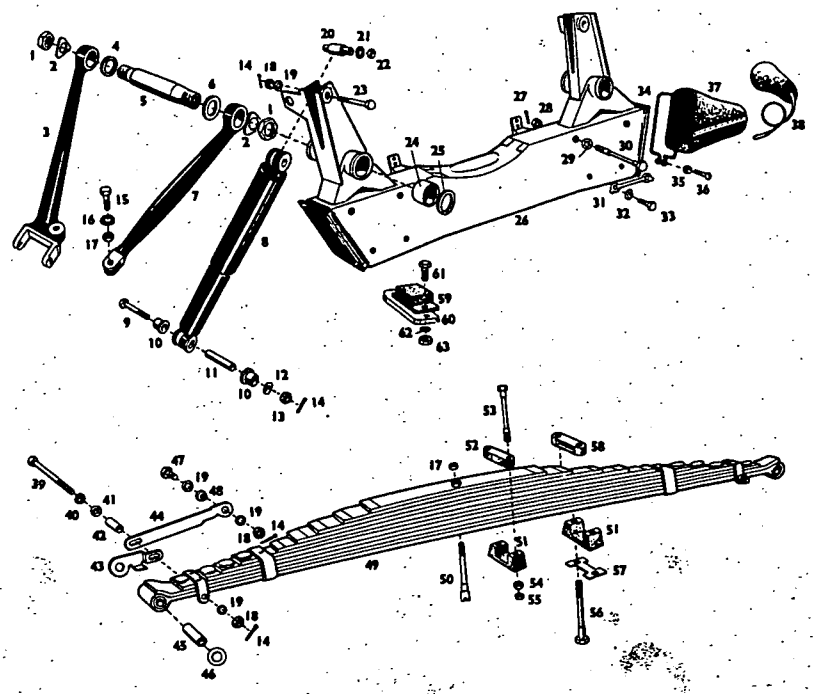
TYPE 404. FRONT SUSPENSION CROSS MEMBER & SPRING

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
FN216/L	1	Thin Nut 1" BSF	4	-	29	Washer ½" plain	4
404-1-23034	2	Lockwasher	4	N.422761	30	Bolt	4
405-1-23035	3	Major Radius Arm	2	N.422201	31	Tabwasher	2
404-1-23005	4	Thrust Washer - Front	2	-	32	Washer ½" Shakeproof	4
404-1-23003	5	Wishbone Fulcrum Pin	2	FS108/6D	33	Setscrew ½" BSF	4
404-1-23014-1		Thrust Washer - Rear .150 thickness		405-1-23020	34	Clip - Gaiter to Crossmember	2
404-1-23014-2		Thrust Washer - Rear .155 thickness		FN104/K	35	Nut ¼" BSF	2
404-1-23014-3		Thrust Washer - Rear .160 thickness		-	36	Screw ¼" BSF Rd Hd. 2" long	2
404-1-23014-4		Thrust Washer - Rear .163 thickness		N.421941	37	Gaiter for Spring Leaves	2
404-1-23014-5		Thrust Washer - Rear .167 thickness		N.422011	38	Gaiter for Spring End RH	1
404-1-23014-6	6	Thrust Washer - Rear .115 thickness	2	N.422051	-	Gaiter for Spring End LH	1
404-1-23014-7		Thrust Washer - Rear .120 thickness	selec-	FB105/30D	39	Bolt 5/16" BSF	2
404-1-23014-8		Thrust Washer - Rear .125 thickness	tive	AGS586/G	40	Double Coil Spring Washer 7/16" dia.	2
404-1-23014-9		Thrust Washer - Rear .130 thickness		-	41	Washer 7/16" dia. 17 SWG	2
404-1-23014-10		Thrust Washer - Rear .135 thickness		N.422851	42	Distance Piece	2
404-1-23014-11		Thrust Washer - Rear .140 thickness		405-1-23038	43	Safety Link	2
404-1-23014-12		Thrust Washer - Rear .145 thickness		N.422831A	44	Safety Strap RH	1
404-1-23004	7	Minor Radius Arm	2	N.422831B	-	Safety Strap LH	1
404-1-23025	8	Front Telescopic Shock Absorber (Girling)	-	N.421821-2	45	Bush - Front Spring	2
404-1-23048	-	Front Telescopic Shock Absorber (Armstrong)	-	N.422961-1		Washer .113 thickness	
404-II-23081	-	Front Telescopic Shock Absorber (Telaflo)	-	N.422961-2		Washer .120 thickness	
FB106/30D	9	Bolt 3/8" BSF	2	N.422961-3	46	Washer .127 thickness	.2
N.722017	10	Distance Piece - Bottom	4	N.422961-4		Washer .134 thickness	selec-
N.722015	11	Distance Piece - Bottom	2	N.422961-5		Washer .105 thickness	tive
-	12	Washer 3/8" Plain	2	FB105/9D	47	Bolt 5/16" BSF	2
FN406/L	13	Nut 3/8" BSF	2	N.422841	48	Distance Piece	2
-	14	Split Pin 1/16" dia 1" long	2	404-1-23002	49	Front Transverse Spring	1
FB106/10D	15	Bolt 3/8" BSF	2	404-1-23032	50	Centre Bolt	1
-	16	Washer 3/8" Shakeproof	2	N.421811	51	'U' Piece for Spring	2
FN106/L	17	Nut 3/8" BSF	3	N.421831	52	Yoke for Spring	2
FN405/L	18	Nut 5/16" BSF	6	404-1-23031	53	Bolt	4
-	19	Washer 5/16" Plain	6	FN107/K	54	Nut 7/16" BSF	4
404-1-23006	20	Spool	2	FN207/K	55	Locknut 7/16" BSF	4
404-1-23028	21	Washer	4	-	56	)	
FN208/K	22	Thin Nut ½" BSF	4		57	)Not used on Type 404	
FB105/24D	23	Bolt 5/16" BSF	2		58	)	
404-1-23001-6	24	Bush for Fulcrum Pin	2	N.421851	59	Rubber Buffer	2
404-1-23033	25	Felt Seal	2				
404-1-23033	25	Felt Seal	2	-	60	Not used on Type 404	
405-1-23009	26	Crossmember No.1.	1	-	61	Bolt 2BA Hex Hd 5/8" long	4
-	27	Split Pin 3/32" dia. 1¼" long	4	-	62	Washer 2BA Shakeproof	4
FN408/L	28	Nut ½" BSF Slotted	4	-	63	Nut 2BA Plain	4



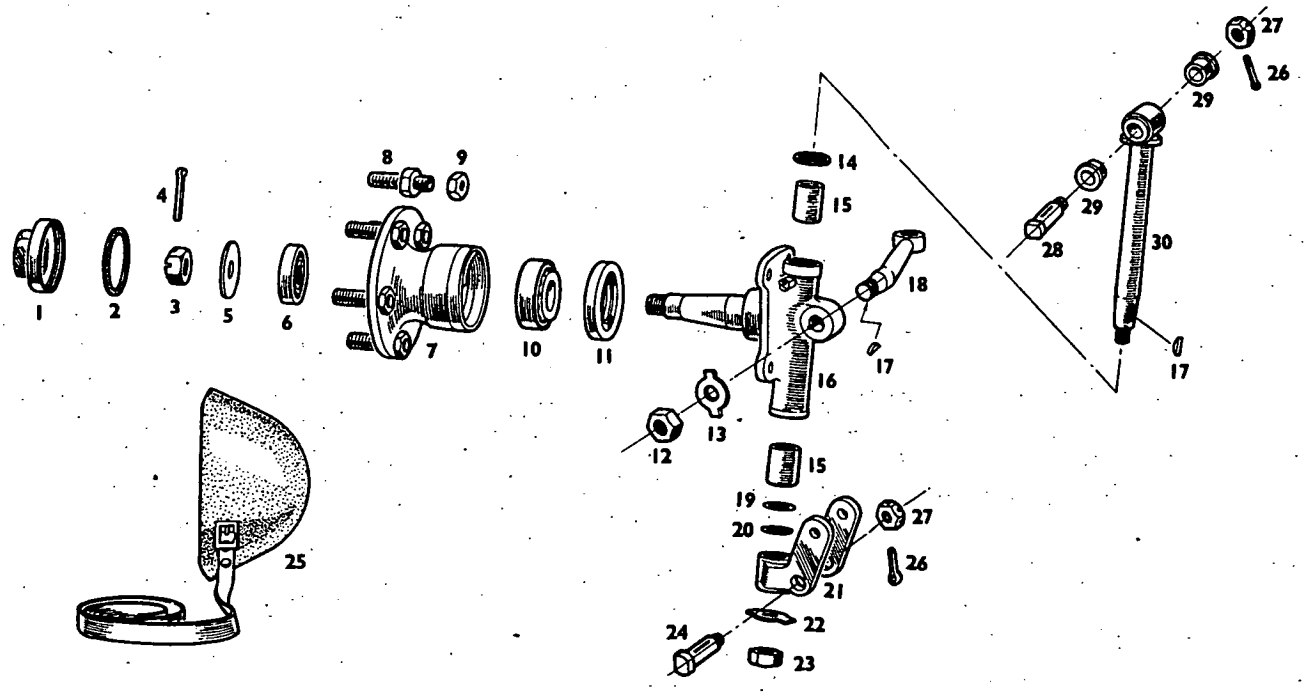
TYPE 405. FRONT SUSPENSION CROSS MEMBER & SPRING.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
FN.216/L	1	Thin Nut 1" BSF	4	-	29	Washer ½" Plain	4
404-1-23034	2	Lockwasher	4	N.422761	30	Bolt	4
405-1-23035	3	Major Radius Arm	2	N.422201	31	Tabwasher	2
404-1-23005	4	Thrust Washer - Front	2	-	32	Washer ½" dia. Shakeproof	4
404-1-23003	5	Wishbone Fulcrum Pin	2	FS108/6D	33	Setscrew ½" BSF	4
404-1-23014-1	6	Thrust Washer - Rear .150 thickness)		405-1-23020	34	Clip - Gaiter to Crossmember	2
404-1-23014-2	-	Thrust Washer - Rear .155)		FN104/K	35	Nut ¼" BSF	2
404-1-23014-3	-	Thrust Washer - Rear .160)		-	36	Screw ¼" BSF Rd. Hd 2" long	2
404-1-23014-4	-	Thrust Washer - Rear .163)		N.421941	37	Gaiter for Spring Leaves	2
404-1-23014-5	-	Thrust Washer - Rear .167)		N.422011	38	Gaiter for Spring End RH.	1
404-1-23014-6	-	Thrust Washer - Rear .115)		N.422051	-	Gaiter for Spring End LH.	1
404-1-23014-7	-	Thrust Washer - Rear .120)	as reqd	FB105/30D	39	Bolt	2
404-1-23014-8	-	Thrust Washer - Rear .125)		AGS586/G	40	Double Coil Spring Washer 7/16" dia.	2
404-1-23014-9	-	Thrust Washer - Rear .130)		-	41	Washer 7/16" dia. 17 SWG	2
404-1-23014-10	-	Thrust Washer - Rear .135)		N.422581	42	Distance Piece	2
404-1-23014-11	-	Thrust Washer - Rear .140)		405-1-23038	43	Safety Link	1
404-1-23014-12	-	Thrust Washer - Rear .145)		N.422831A	44	Safety Strap RH.	1
404-1-23004	7	Minor Radius Arm	2	N.422831B	-	Safety Strap LH.	1
404-1-23025	8	Front Telescopic Shock Absorber	2	N.421821	45	Bush - Front Spring	2
FB.106/30D	9	Bolt 3/8" BSF	2	N.422961-1	46	Washer .113 thickness	2
N.722017	10	Distance Piece	4	N.422961-2	-	Washer .120 thickness	-
N.722015	11	Distance Tube	2	N.422961-3	-	Washer .127 thickness	-
-	12	Washer 3/8" Plain	2	N.422961-4	-	Washer .134 thickness	-
FN406/L	13	Nut 3/8"Slotted	2	N.422961-5	-	Washer .105 thickness	-
-	14	Split Pin 1/16" dia. 1" long	4	FB105/9D	47	Bolt 5/16" BSF	2
FB.106/10D	15	Bolt 3/8" BSF	2	N.422841	48	Distance Piece	2
-	16	Washer 3/8" Shakeproof	2	405-1-23018	49	Front Transverse Spring	1
FN.106/L	17	Nut 3/8" BSF	2	405-1-23013	50	Centre Bolt	1
FN.405/L	18	Nut 5/16" BSF	6	N.421811	51	'U' Piece for Spring	2
-	19	Washer 5/16" Plain	6	N.421831	52	Yoke for Spring) Used on	2
404-1-23006	20	Spool	2	405-1-23012	53	Bolt) Chassis	4
404-1-23028	21	Washer	4	FN107/K	54	Nut 7/16" BSF) 4000 to	4
FN.208/L	22	Thin Nut ½" BSF	2	FN207/K	55	Locknut 7/16" BSF) 4051.	4
FB105/25D	23	Bolt 5/16" BSF	2	404-II-23089	56	Bolt)	4
404-1-23001-6	24	Bush for Fulcrum Pin	4	404-II-23091	57	Locking Plate) Used on Chassis 4052 on	2
404-1-23033	25	Felt Seal	4	404-II-23090	58	Yoke)	2
405-1-23009	26	Cross Member No.1	1	N.421851	59	Rubber Buffer	2
		Used on Chassis 4000-4051		405-1-23027	60	Packing Piece	2
404-II-23092	-	Cross Member No.1	1	-	61	Bolt 2BA x 1" long	4
		Used on and from Chassis 4052		-	62	Washer 2BA Shakeproof	4
-	27	Split Pin 3/32" dia. 1¼" long	4	-	63	Nut 2BA Plain	4
FN.408/L	28	Nut ½" BSF Slotted	4				



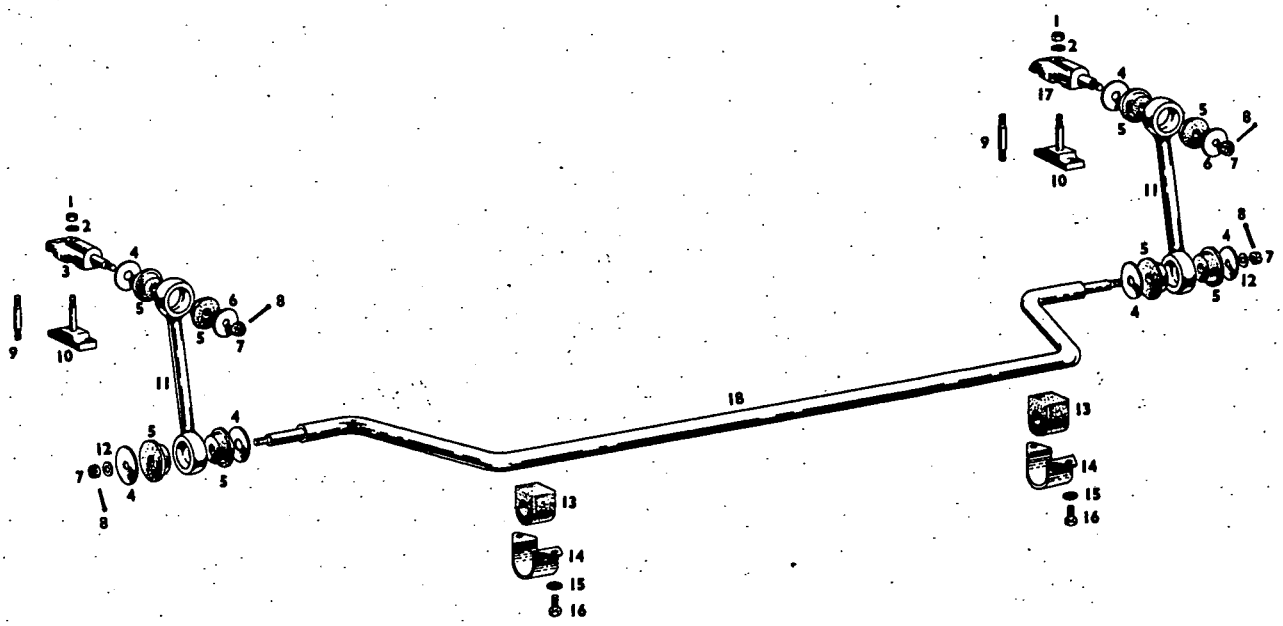
HUB AND STUB AXLE ASSEMBLY R.H. AND L.H.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.421141	1	Dust Cap	2	404-1-23035	18	Steering Arm L.H.	1
405-1-23036	2	Gasket - Dust Cap	2	404-1-23036	-	Steering Arm R.H.	1
404-1-23046	3	Nut-Hub Retaining	2	N.421201	19	Shim .010 thickness	as reqd
-	4	Split Pin 1/8" dia. x 1" long	2	N.421211	20	Shim .005 thickness	as reqd
404-1-23047	5	Washer - Hub Retaining Nut	2	N.722011	21	Bottom Bracket L.H.	1
404-1-23049	6	Outer Taper Roller Bearing	2	N.722012	-	Bottom Bracket R.H.	1
404-1-23056	7	Wheel Hub complete with Studs	2	N.421281	22	Tabwasher	2
404-1-23041	8	Wheel Stud	10	FN.109/K	23	Nut 9/16" BSF	2
FN.208/K	9	Nut ½" BSF	10	N.421921	24	Bottom Pin	2
N.721009	10	Inner Taper Roller Bearing	2	N.422071	25	Gaiter for Radius Arm R.H.	1
404-1-23045	11	Oil Seal	2	N.422101	-	Gaiter for Radius Arm L.H.	1
FN.110/K	12	Nut 5/8" BSF	2	-	26	Split Pin 3/32" dia. x 1¼" long	4
N.421271	13	Tabwasher	2	FN408/K	27	Nut ½" BSF Slotted	4
N.421191	14	Thrust Washer	2	404-1-23016	28	Top Pin	2
404-1-23021	15	Bush for Stub Axle	4	404-1-23026	29	Bush - Swivel Pin	4
404-1-23052	16	Stub Axle L.H. complete with Bushes	1	404-1-23019	30	Swivel Pin L.H. complete with Bushes	1
404-1-23053	-	Stub Axle R.H. complete with Bushes	1	404-1-23020	-	Swivel Pin R.H. complete with Bushes	1
N.422291	17	Key	4				



ANTI ROLL BAR.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
FN.106/L	1	Plain Nut 3/8" BSF	2	N.704157	10	Clamping Plate complete	2
-	2	Shakeproof Washer 3/8"	2	N.704169	11	Tie - Rod	2
N.704173A	3	Clamp LH	1	-	12	Plain Washer 3/8"	2
N.704167	4	Washer - Large	4	404-1-20152	13	Rubber Bearing	2
N.704168	5	Harrisflex Bearing CW932	8	N.704156	14	Bearing Clamp	2
N.704170	6	Washer - Small	4	-	15	Shakeproof Washer 5/16"	4
FN406/L	7	Slotted Nut 3/8" BSF	4	FS105/5D	16	Setscrew 5/16" BSF x 5/8" long	4
-	8	Split Pin 1/16" dia. x 1¼" long	4	N.704173B	17	Clamp RH	1
N.704159	9	Stud	2	404-1-20151	18	Anti-Roll Bar	1



Front Suspension

General Data

Type.	Independent Transverse leaf spring with direct acting telescopic shock absorbers. Anti-roll bar fitted.
Tracking.	Toe-in 1/8 to 3/16 inch. (3.18 to 4.76 m/m) measured at the rims at kerb side weight.
Camber angle.	0° at kerb weight. (not adjustable).
End float of swivel pin.	.000 to .003 inch. (.000 to .08 m/m) adjusted by shims.
Diametral clearance of swivel pin.	.0002 to .002 inch (.0005 to .05 m/m).
Torque loading of swivel pin nut.	40 to 50 lb.ft. (59.52 to 74.41 Kg/m).
End float of Front Spring eye in bottom bracket	.000 to .007 inch (.000 to .18 m/m).
Diametral clearance of bottom pin in spring bush.	.0012 to .0042 inch (.03 to .1 m/m).
Torque loading of steering arm securing nut.	50 to 60 lb.ft. (74.41 to 89.29 Kg/m).
Diametral clearance of Top pin in Radius Arms and Swivel Pin Bush.	.0005 to .0025 inch. (.013 to .07 m/m).
Torque loading of front spring anchorage nuts.	38 to 42lb.ft. (57.55 to 62.5 Kg/m).
End float of suspension bracket fulcrum pin.	.002 to .004 inch (.05 to .10 m/m).

Front Suspension

This is shown in Plan and Front View with sections of the spring clamping in Fig.104.

The parts normally requiring attention for the maintenance of the front suspension and hub and stub axles are the swivel pins, the top and bottom pins, the bearings and oil seal of the hubs, and the suspension bracket assembly.

Hub and Stub Axle Assembly

This assembly shown in Fig.105 can be detached completely from the front suspension.

Jack up the front of the car and support on chassis stands. Remove the road wheel.

Disconnect the flexible brake pipe at the backplate and disconnect the 'One-Shot' flexible pipe from the stub axle. Remove all the gaiters.

Break the taper joint connecting the steering tie tube to the steering arm using extractor TFN.5006.

Remove the bottom pin connecting the bottom bracket to the front spring eye and the bolt connecting the telescopic shock absorber to the bottom bracket.

Remove the top pin connecting the swivel pin to the radius arms and withdraw the whole assembly.

Swivel Pins

The diameter of the pin is .799 - .0005 inch and if worn badly it should be replaced. If not worn badly the phosphor bronze bushes can be replaced, if necessary. New swivel pins are provided with the bushes and are reamed to size.

To replace the bushes, drive the old ones out and press in the new bushes. Ream to give the clearance of .0005 to .0025 inch for the top pin and face to the dimension shown in Fig.106.

Stub Axle

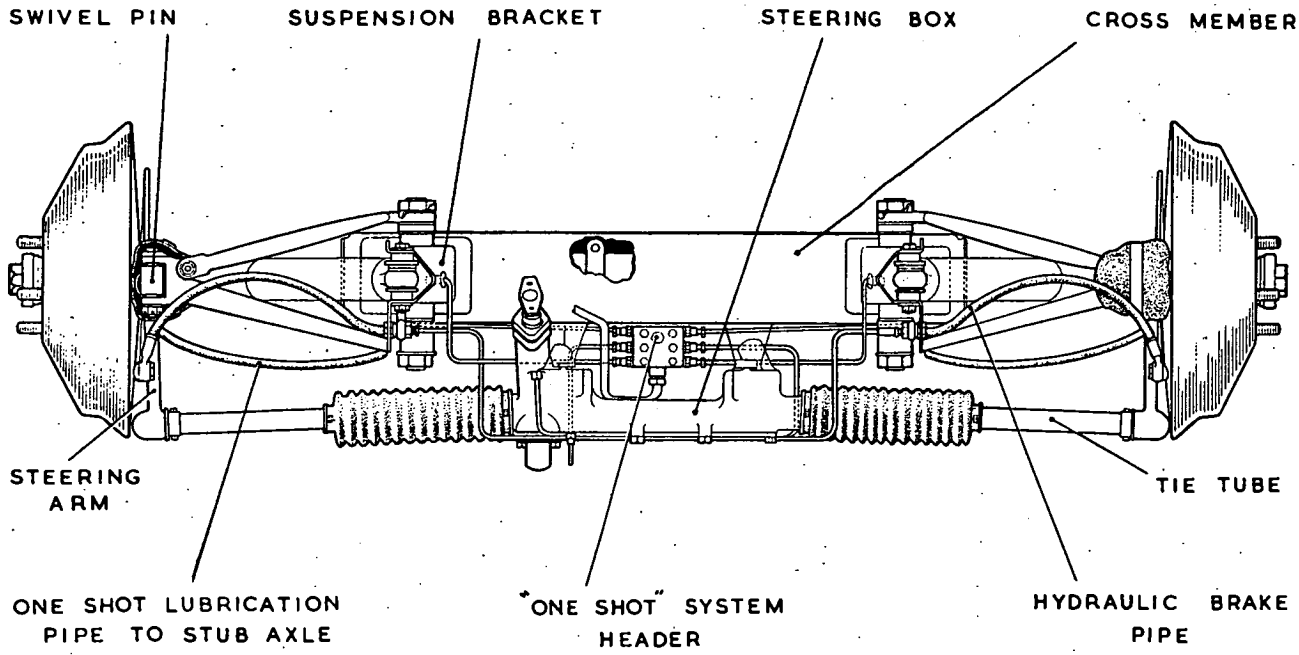
To remove the refit the phosphor bronze bushes in the stub axle, drive out the worn bushes.

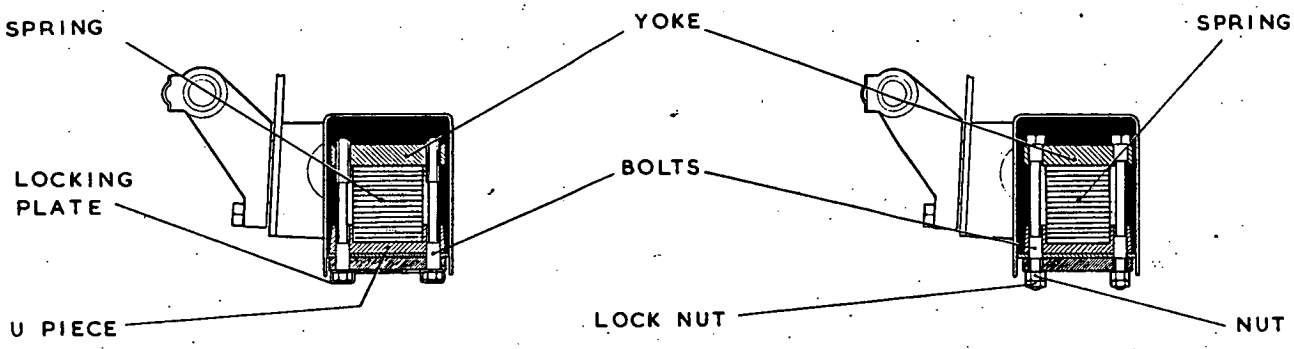
Press in the new bushes until level with the face. The chamfered end of each bush should be entered first to ensure that the spiral oil groove is fitted correctly.

In manufacture a special reamer TFN.4578 is used to line ream the bores to accept the swivel pin. In the absence of a suitable reamer the bores should be scraped to give the clearance of .0002 to .002 inch for the swivel pin.

Front Transverse Spring Bushes

Drive out the existing phosphor bronze bushes and press in the replacement bushes.





LATE TYPE EARLY TYPE

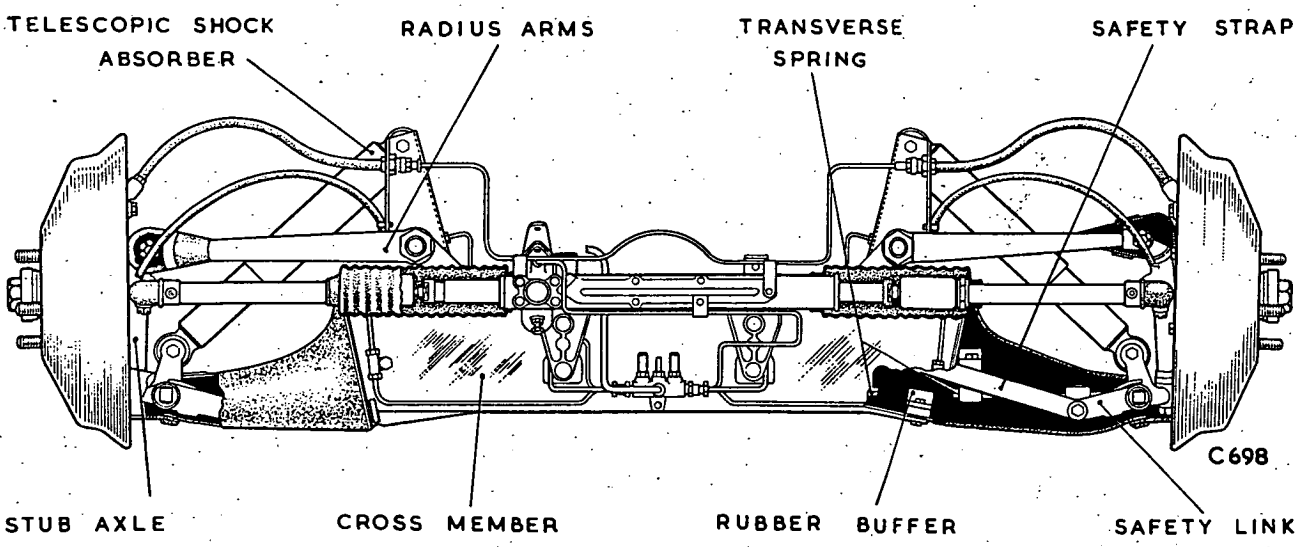


Fig. 104. G.A. views with spring clamping

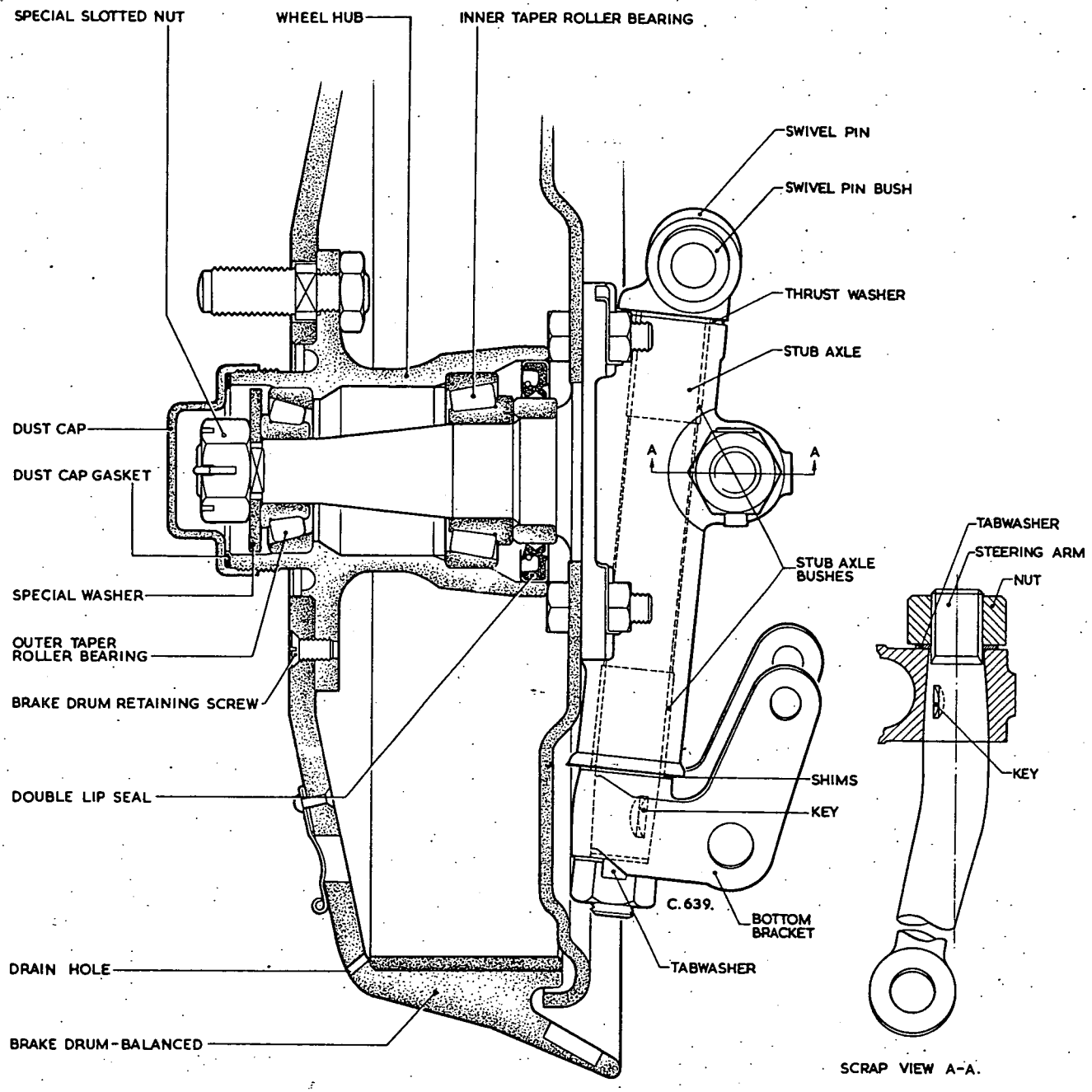


Fig. 105. Hub and stub axle assembly

Ream to give the clearance of .0012 to .0042 inch for the bottom pin.

Bottom Brackets

These brackets are not bushed and if the bores for the location of the bottom pins or telescopic shock absorber should be worn they should be replaced.

To Re-assemble the Swivel Pin to the Stub Axle

Fit the thrust washer to the swivel pin with the inner chamfer directly beneath the head of the pin. Well oil the swivel pin and position it in the stub axle. Disregard the shims and key fit the bottom bracket and the nut and tighten.

With feeler gauges determine the end float of the swivel pin and deduct from it the permissible end float of .000 to .003 inch.

Remove the nut and bottom bracket and fit the predetermined thickness of shims. Fit the key, refit the bottom bracket, fit a tabwasher and the nut. Tighten the

nut to a torque loading of 40 to 50 lb.ft. and recheck the end float. If satisfactory lock the tabwasher.

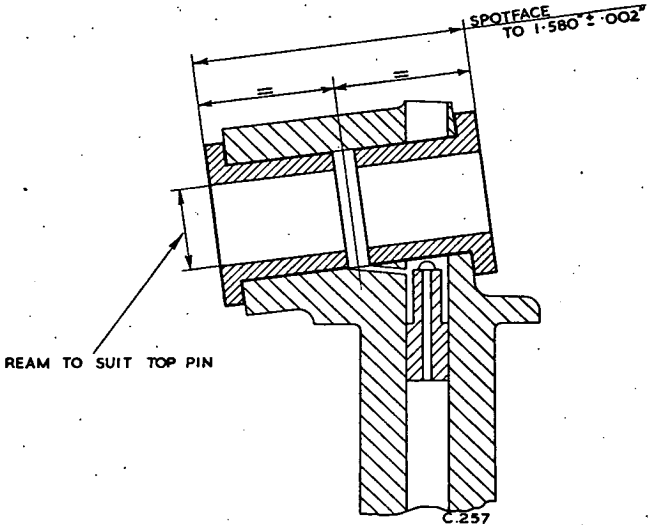


Fig. 106. Swivel pin bush dimension

To Replace the Roller Races or Oil Seal in the Hub

Refer to Fig105for this assembly.

Remove the brake drum which is held in position by the two 5/16 countersunk head screws, then remove the dust cap, which has a right hand thread, and its gasket.

Withdraw the split pin and remove the slotted nut and washer. Fit the hub extractor Fig107and withdraw the hub together with the front taper roller bearing and the outer race of the rear bearing.

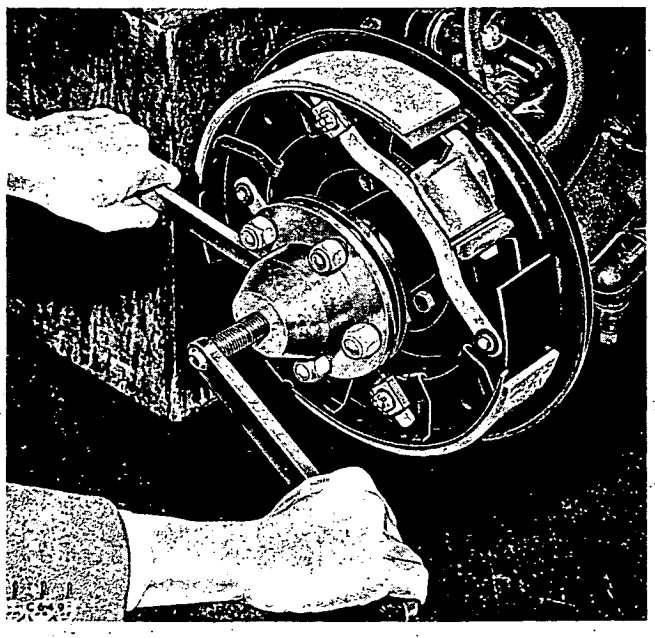


Fig. 107. Extracting front hubs

It is possible that the oil seal is tight enough to withdraw the roller race entirely as it is only a push fit on the stub axle.

The oil seal will be unfit for further use and can be prised off.

Should the inner race still be on the axle and difficult to remove then the procedure is as follows.

Break up and remove the rollers of the race. Remove the bolts attaching the backplate and remove the backplate. With a tool, similar to a caulking tool, drive the inner race from its location. It will be useless for further use.

Care should be taken not to drive off or interfere with the hardened oil seal location on the stub axle which is a permanent fitting.

Finally press the outer races from the hub.

To Refit the Hubs

First check the diameter of the location of the inner roller race on the stub axle. This should be 1.1805 to 1.1800 inch and will allow the inner roller race to press on without force.

Fit the outer cages of the bearings to the hub, thoroughly grease the rollers and inner race of the inner bearing and position in the hub. Press the oil seal into the hub and fill the inner groove with graphite grease.

If the brake backplate has been removed bolt it into position, and lock with the tabwashers.

Fit the hub over the shaft, locate the bearing then push and turn the hub until the bearing and oil seal are in position.

Pack the hub three quarters full with specified hub grease. Thoroughly grease the inner race and rollers of the outer bearing and press into position on the shaft.

Fit the special washer followed by the nut. Tighten the nut to ensure that the rear bearing is fully home and then slacken off to give a clearance of .001 to .003 inch (while spinning the brake drum) before fitting the split pin. The fine thread and the two positions for the split pin should allow close adjustment.

Fit and tighten the dust cap with its gasket, but do not fill the dust cap with grease as the tightening of the cap could force the grease past the oil seal.

Refit the brake drum.

Brake Drums

Brake drums are located by the centre bore which fits the spigots of the front hub and by the five holes which fit the plain portion of the wheel stud.

They are readily removed by unscrewing the two 5/16 countersunk screws which attach the drum to the hub.

Although the drums are carefully balanced individually and are fully interchangeable it is recommended that they are refitted to their original positions.

Suspension Bracket Assembly

This is the top joint of the radius arms shown in section in Fig.108and it is controlled for end thrust by selective thrust washers.

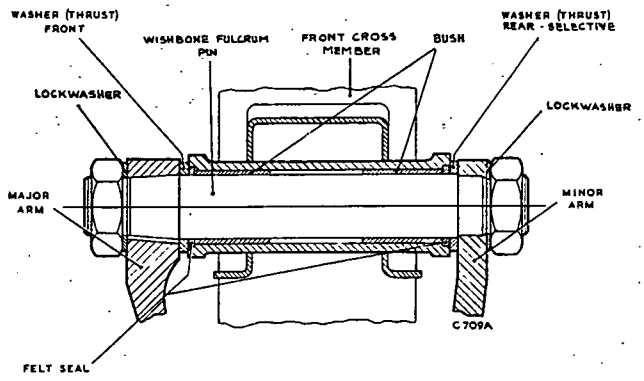


Fig. 108. Suspension bracket assembly

On early cars it is necessary to cut the valance away to allow access for the spanner to the thin nuts. On later cars this was made accessible.

To adjust the end float jack up the car and support the front on chassis stands. Remove the road wheels.

Remove the gaiters protecting the top swivel pin joint to the radius arms and remove the top pin. Release the clamps attaching the anti-roll bar and remove the 3/8" bolt connecting the minor arm to the major arm thus allowing the arms to become free.

The end float permissible at the suspension bracket attachment is .002 to .004 inch and before slackening it is advisable to check the actual end float. From this a suitable thrust washer can be selected. Check the tightness of the front nut.

Release the lockwasher and slacken off the rear thin nut. In order to release the thrust washer, the spindle and its major arm must be pushed forward to provide clearance for the removal of the nut and minor arm.

Remove the rear thrust washer and measure the thickness. Thrust washers are available in the following sizes, .115, .120, .125, .130, .135, .140, .145, .150, .155, .160, .163, .167. Having previously taken the end float a suitable thrust washer can be selected.

To re-assemble fit the thrust washer, the inner arm, the lockwasher and the thin nut by pushing the spindle rearwards. Tighten the nut and check the end float.

If satisfactory lock the nut, reconnect the minor arm to the major arm, and the anti roll bar clamp. Fit the top pin and gaiter and finally fit the road wheel.

Front Transverse Leaf Spring

To remove the front transverse spring first keep the car on the wheels, remove the gaiters and remove the rubber blocks and any packing pieces each end of the front cross member. These blocks were not fitted to early Type 404 cars.

Raise the front of the car and support on chassis stands, then remove the front wheels and stub axle assemblies as described.

Referring to Fig.104 it will be noted that the spring clamping is of two types, on the earlier cars it will be necessary to remove the front engine mounting bolts and lift the engine sufficiently to withdraw the spring clamping bolts from the top. On later cars this is not necessary as the locking tabs will be turned back and the bolts withdrawn downwards.

Remove the yokes from the top of the spring inside the cross member. Lift the spring from its centre bolt spigot location in the cross member and withdraw it from one side or the other.

To Refit the Spring

Fit the spring into the cross member and locate on its centre bolt spigot locations.

Locate one of the 'U' pieces and a top yoke and loosely screw in two bolts to retain them. Fit the other 'U' piece and yoke and screw in the remaining two bolts. On the later type of clamping fit the two locking plates. Tighten all of the bolts with the centre spigot located but do not tighten them fully or lock them.

If the engine has been lifted, lower it and refit the engine mounting bolts.

Refit the stub axle assemblies and the front wheels.

Lower the car to the ground and tighten the spring clamping bolts to 38 to 42 lb.ft. Lock them with the locking plate or lock nuts, as applicable.

Refit the rubber buffers and packing pieces which were removed and finally refit the gaiters.

End Float—Front Spring Eye to Bottom Bracket

See Fig.109 The permissible end float at this point is .000 to .007 inch and this is controlled by hardened selective thrust washers in .105, .113, .120, .127, .134 thicknesses.

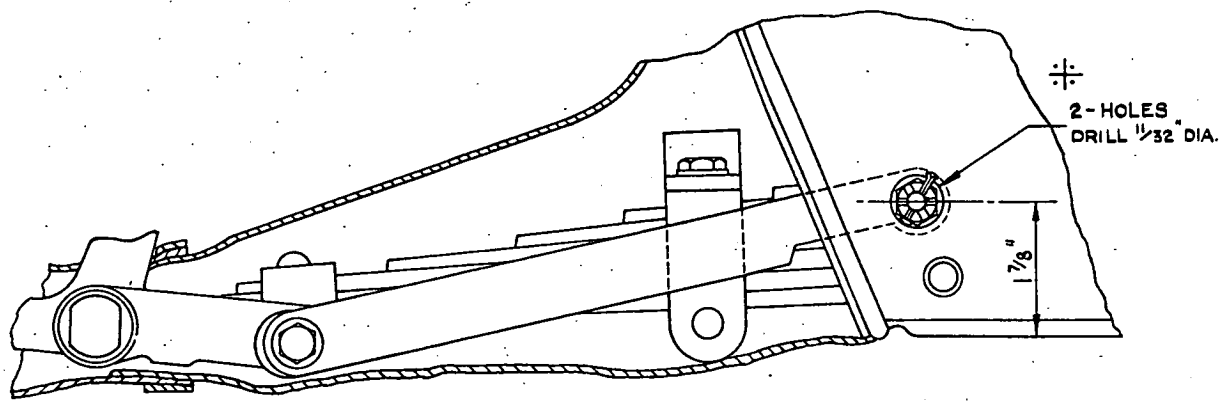
Select a washer to give the correct clearance and using the thread protector and lead-in TFN.5001 insert the bottom pin from the front, locating it on its flat, then tighten the nut and lock with a split pin.

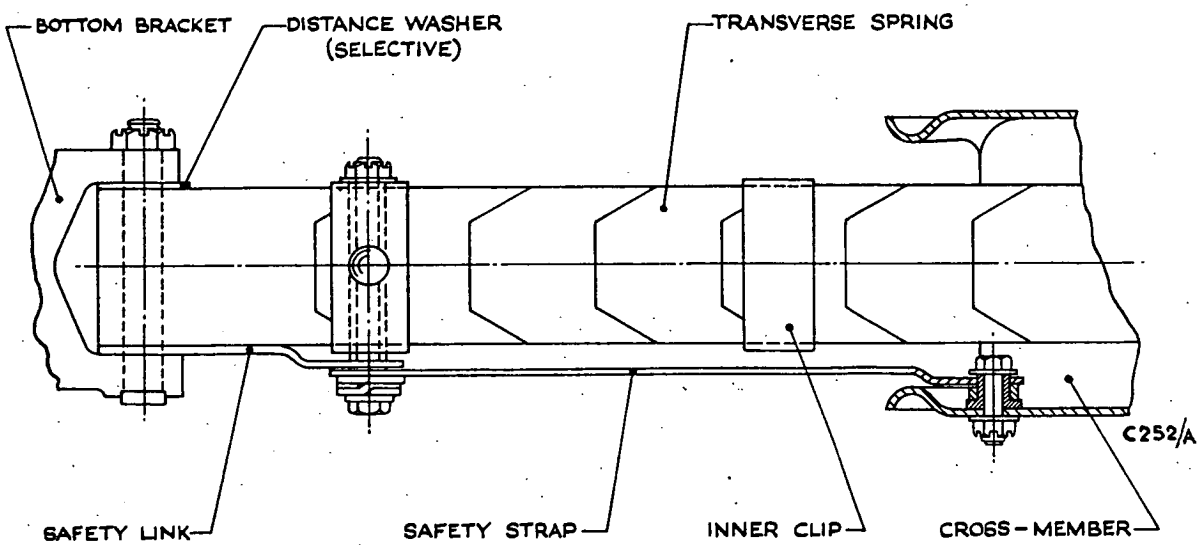
It is recommended that the bottom pin is inserted with a lead-in otherwise the hardened bottom pin will shear any slight mis-alignment of the phosphor bronze bush in the spring eye.

Safety Straps

Referring to Fig 109the safety straps retain the wheels in position in the event of front spring leaf failure.

Two important points should be noted. The attachment bolt of the safety strap to the cross member cannot be fitted when the front spring is clamped in the cross member. It must therefore be inserted at an early stage.





INSTRUCTIONS FOR FITTING SAFETY STRAP N 422831 A/B
2 HOLES TO BE DRILLED IN CROSS MEMBER N 422501
TO GIVE THE FOLLOWING CONDITIONS :-
1. WHEN TRANSVERSE SPRING IS IN STATIC POSITION THERE SHOULD BE 1/16" CLEARANCE BETWEEN END OF SLOT IN N 422831 A & B SAFETY STRAP AND 5/16" BOLT ON THE INSIDE (I.E. TOWARDS THE VERTICAL ℄ OF CROSS-MEMBER.)
2. WHEN TRANSVERSE SPRING IS FREE (UNLOADED) THERE SHOULD BE 1/16" CLEARANCE BETWEEN OUTER END OF SLOT AND BOLT.

Fig. 109. Safety strap and link attachment

A new front cross member is not drilled for the safety strap attachment as the 1/16 inch clearance at either end of the elongation in the strap is controlled by certain conditions. For practical purposes these two holes could be drilled in the same position as on the removed cross member.

A check could be taken during road test to ensure that the safety strap elongation has the necessary clearance.

Anti-roll Bar

The anti-roll bar Fig110 is attached to the radius arms and to the chassis frame members. The only maintenance required after considerable service would be the replacement of the rubber bearings. Note that the torque loading of clamping nut to the radius arms is 18lb.ft. (26.78Kg/m).

On every car, however, both the shock absorbers were the same type.

Armstrong. Ref. AT7/1185. Eye fitting at both ends.
Settings (850/75
(75/650

Telaflo. Ref.6-T1-EE. High Duty with Bump Stop. Eye fitting both ends. Open length 17". Closed length (Rubber touching) 11.5/8. Closed length (Rubber compressed) 11.5/16 inch.
Setting. AS. SP.50001.

Girling. Ref. DAS6/154 NF. with Bump Rubbers. Part No. SA/287/1. Eye fitting both ends.

Settings (Bump. 130/15
(Rebound 175/15.

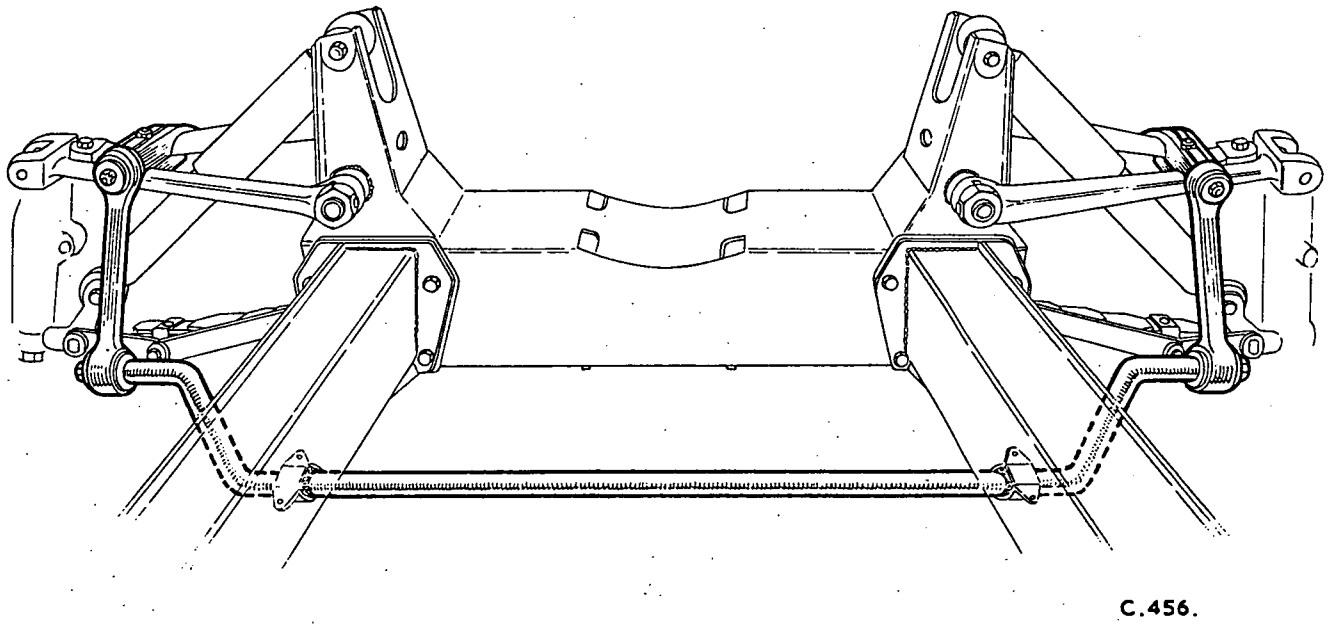


Fig. 110. Anti-roll bar

Steering Arms

The steering arms are right hand and left hand. They locate in a taper keyed hole in the stub axle. See Fig.105

Replacing Wheel Studs

Remove the peening which secures the locknut and remove the nut. The flange is threaded and to avoid damage when unscrewing the stud saw the peened end of the stud away. Screw the stud out carefully.

Screw in the new stud, fit and tighten the locknut and finally peen.

Telescopic Shock Absorbers

On the front suspension of Type 404 Cars, the following types of telescopic shock absorbers were fitted.

The latter shock absorber is fitted to all Type 405 Cars.

Replacements

Should it be considered that a telescopic shock absorber requires replacement a check should first be taken to see that the taper rubbers, two at each end, are in good order and securely fitted. Replacement rubbers are available.

Serviced replacement shock absorbers are normally available from the manufacturers agents.

Removing Shock Absorbers

Jack up the car and support the front with chassis stands. For convenience remove the road wheel.

Working inside the wheel arch disconnect the shock absorber from its attachment to the bottom bracket. See Fig.111

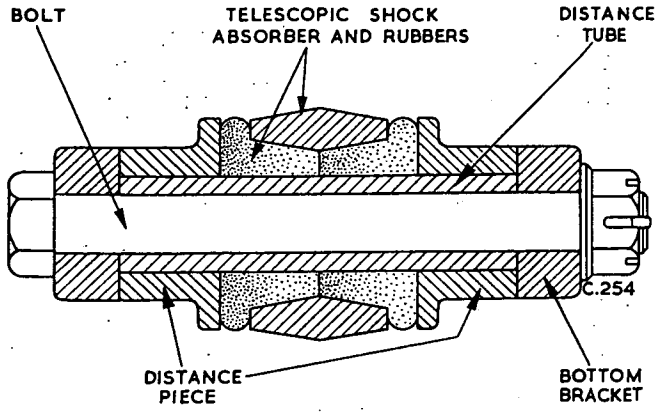


Fig. 111. Shock absorber lower attachment

Working from inside the bonnet disconnect the shock absorber from the suspension bracket see Fig.112 In many instances on the right hand side it is necessary to disconnect the brake pipe at this point to allow for the withdrawal of the bolt. Should this be the case the brake pipe can be immediately reconnected and the bolt inserted the other way round when re-assembled.

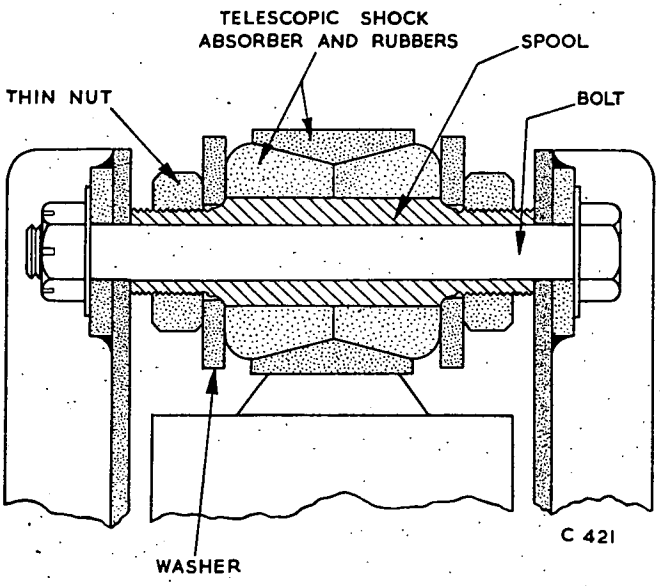


Fig. 112. Shock absorber upper attachment

Refitting Shock Absorbers

Assemble the top eye as shown in Fig.112 Position the shock absorber between the radius arms and position the top location into the suspension bracket.

Assemble the bottom location as shown in Fig.111 and compress to the length of the distance piece to permit entry into the bottom bracket, line up the bolt holes, insert the bolt tighten and split pin.

At the top location fit the bolt from the back end, tighten and split pin.

Removing the Complete Front Suspension Assembly

In the event of damage to the front of car whereby the front suspension needs attention then the whole unit can be detached from the car. If considered necessary it can be sent to the Works for reconditioning and rig testing.

To remove the unit first detach the gaiters at the ends of the front spring and remove any rubber blocks and packing pieces from just inside the front cross member. See location 'M' in Fig.113 These parts can only be removed while the spring is under load.

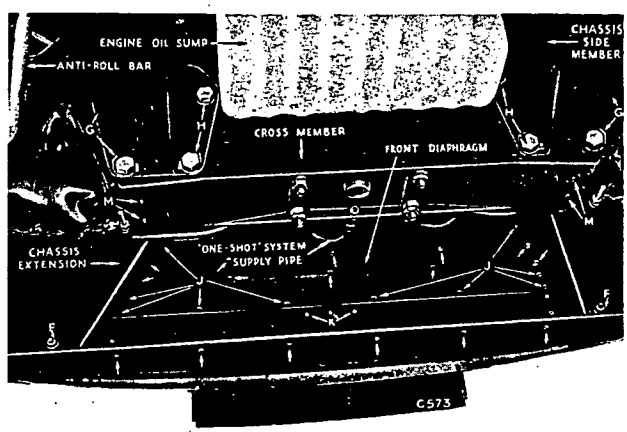


Fig. 113. Removing front suspension assembly

Remove the bonnet, jack up the front of the car and support on chassis stands.

Remove the road wheels.

Disconnect the steering column at the flexible coupling.

Disconnect the clamps attaching the anti-roll bar to the radius arms and disconnect the horns. Remove the bolts 'J' and 'K' and remove the diaphragm and starting handle guide tube.

Remove the Radiator.

Disconnect the 'One-shot' lubrication pipe from the connection on the engine mounting bracket. Detach the brake fluid pipe at the connection 'A' in Fig.114 then unscrew and remove the connection 'B'. This will release the main supply pipe and its banjo 'C'. Holding the connection 'D' Fig.115 unscrew the nut 'E' and withdraw the wheel arch. Detach brake pipe from the other side in a similar manner.

Detach the two bolts 'F' and lift away the front bumper Remove the pipe 'L'.

Referring to the illustrations remove the screw indicated by the arrows.

Support the suspension assembly with a jack.

Remove the two inner bolts shown at 'H' and loosen the bolts at 'G'. Remove the bumper support brackets.

Remove the bolts 'G' and move the whole front sus-

pension forward, then lower the jack and withdraw the assembly clear of the car.

To refit the assembly reverse the order of removal.

When fitting the front cross member securing bolts use the following procedure.

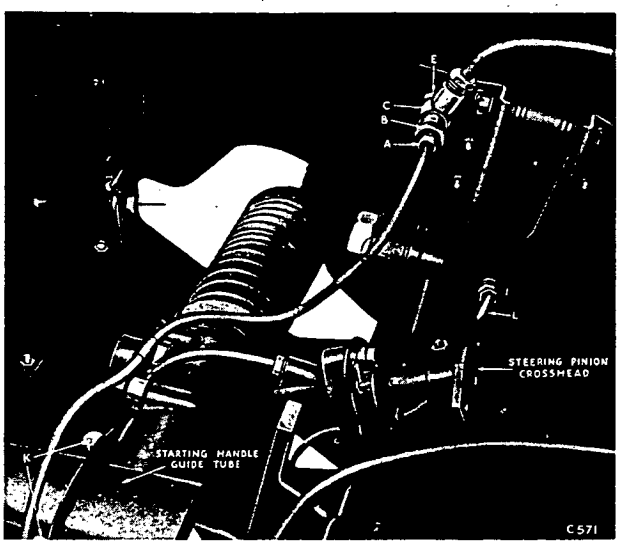


Fig. 114. Removing front suspension assembly

With a plain washer fitted beneath the head enter the two long bolts (the outer bolt from the front and the inner from the rear) through the two upper securing bolt holes on each side of the cross member and the front flange of each chassis side member. Fit a washer and the nut (finger tight).

Fit tabwashers and screw the four bolts in from the rear.

Tighten all nuts and bolts securely, lock the nuts with split pins and the bolts with the tabwashers.

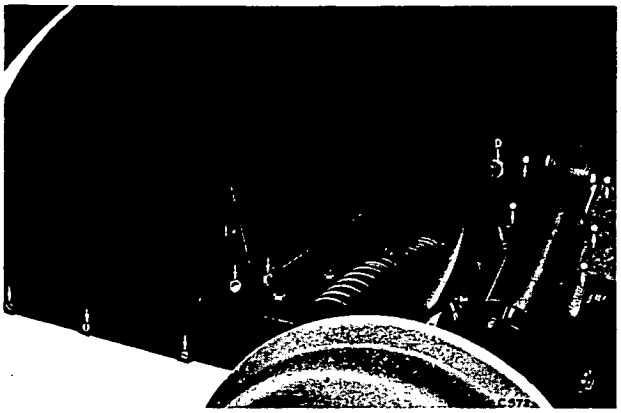


Fig. 115. Removing front suspension assembly

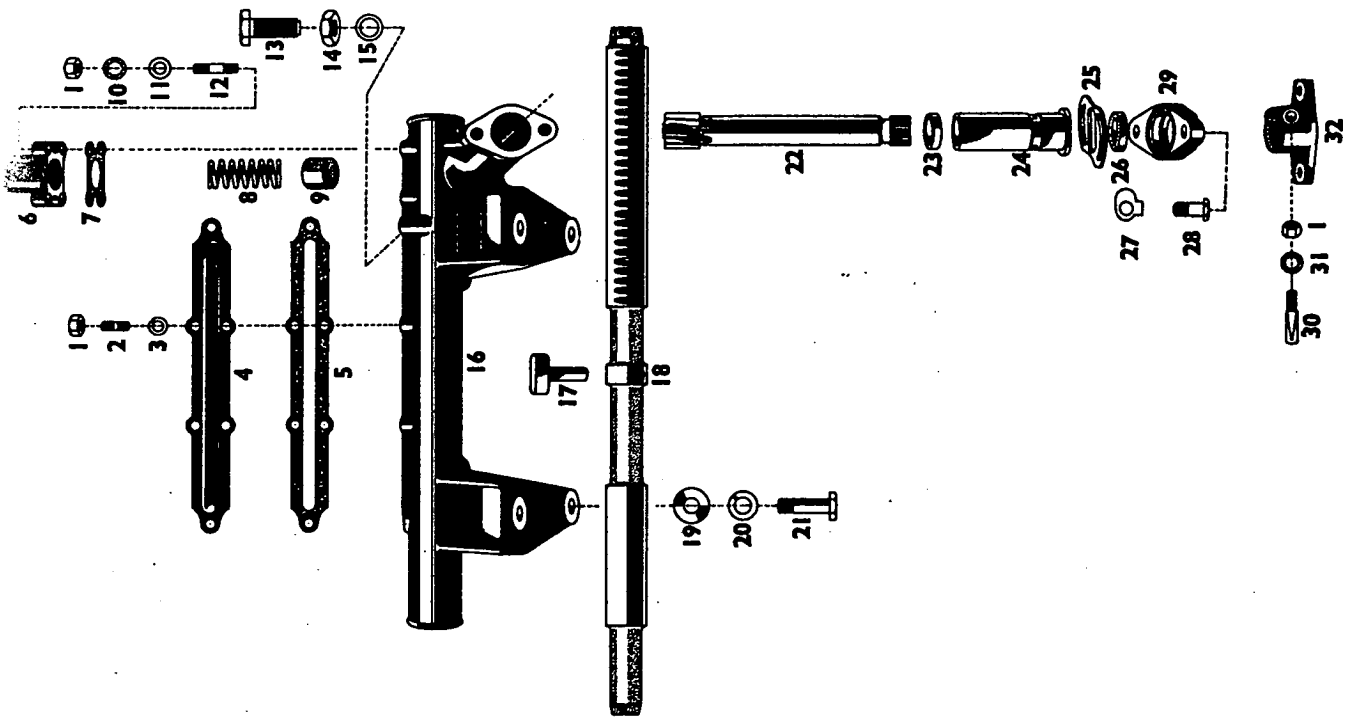
Steering

List of Contents

Steering

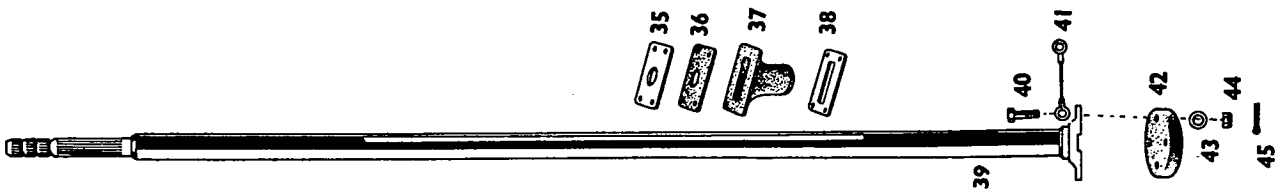
STEERING BOX. RACK AND PINION.

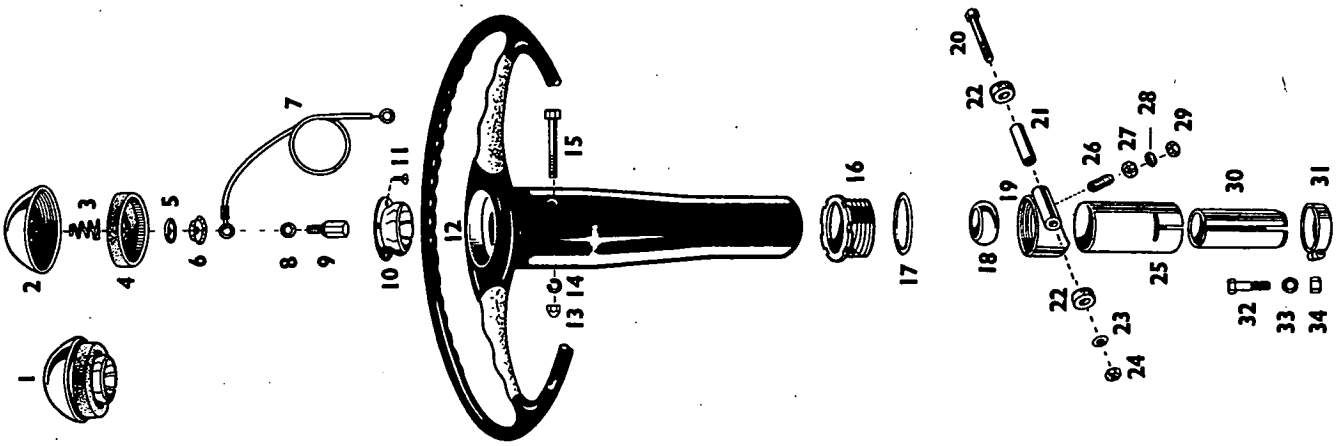
Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.430011	-	Steering Box Assy. R.H. Drive	1	N.430041	17	Locating Bolt for Rack	1
N.431221	-	Steering Box Assy. L.H. Drive	-	N.430031	18	Rack R.H. Drive	1
FN.104/K	1	Nut ¼" BSF	11	N.430631	-	Rack L.H. Drive	1
N.430921	2	Special Stud	6	N.422421	19	Shim	as reqd
-	3	Spring Washer ¼"	6	-	20	Spring Washer 7/16" dia.	4
N.430061	4	Cover Plate for Locating Bolt	1	FB.107/14D	21	Bolt 7/16" BSF	4
N.430051	5	Gasket - Locating Bolt Cover Plate	1	N.430111	22	Pinion Shaft R.H. Drive	1
N.430211	6	Damper Cap	1	N.430641	-	Pinion Shaft L.H. Drive	1
N.430181	7	Gasket for Damper Cap	1	N.430101	23	Thrust Washer for Pinion	1
N.430951	8	Spring for Pressure Block	1	N.430091	24	Eccentric Bush for Pinion	1
N.431101	9	Pressure Block for Damper	1	N.722039	25	Pinion Adjuster	1
-	10	Washer - Shakeproof ¼" 1214 Code/Bead	4	N.430121	26	Packing Ring for Bush Retainer	1
-	11	Washer Plain ¼"	4	N.430141	27	Lock Washer	2
N.430171	12	Stud (Attachment Damper Cap)	4	FB.105/8D	28	Bolt 5/16" BSF	2
N.430071	13	Bolt (Adjuster for Pinion End clearance)	1	N.722040	29	Retainer for Bush	1
FN.208/K	14	Nut ½" BSF	1	N.430161	30	Cotter Securing Crosshead	1
N.430081	15	Gasket. For Adjuster Bolt.	1	-	31	Washer Shakeproof ¼" dia. 1114 Code Abduct Type 11	1
N.430021	16	Steering Box R.H. Drive	1				
N.430651	-	Steering Box L.H. Drive	1	N.430151	32	Crosshead for Pinion Shaft	1



STEERING COLUMN ASSEMBLY.

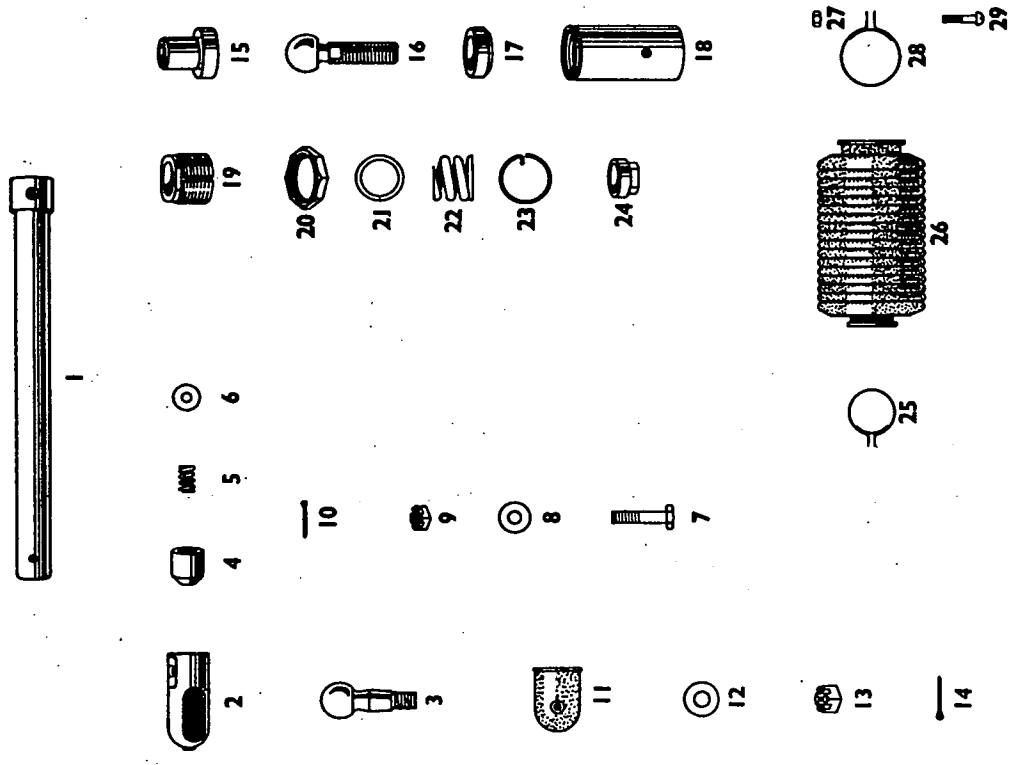
Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.717027	1	Horn Push complete	1	FN.105/L	24	Nut 5/16" BSF	1
N.717024	2	Horn Push	1	405-1-25013	25	Sleeve	1
N.717014	3	Spring	1	404-1-25006	26	Stud 4BA ¾" long	1
N.710010	4	Housing for Horn Push	1	-	27	Nut 4BA Hex.	1
N.717012	5	Contract Cup	1	-	28	Washer 4BA Shakeproof	1
N.717013	6	Contract	1	-	29	Locknut 4BA	1
-	7	Cable complete	1	404-1-25008	30	Insulating Sleeve	1
-	8	4BA Shakeproof Washer	2	N.430841	31	Clip	1
N.717028	9	Special Terminal Horn Push	1	-	32	Bolt 2BA 1¼" long	1
-	10	Spring Cup	1	-	33	Washer 2BA	1
-	11	Screw 6BA Csk.	4	-	34	Nut 2BA	1
405-1-25012	12	Steering Wheel & Fairing Tube	1	404-1-25002	35	Retaining Plate	1
N.717035	13	Domed Nut (Polished Nickel Chromed)	1	404-1-25003	36	Washer	1
AGS.163/E	14	Double Spring Washer 5/16"	1	N.717030	37	Draught Excluder	1
N.717029	15	Bolt 5/16" BSF	1	N.717008	38	Draught Excluder Plate	1
N.430691	16	Retaining Screw	1	405-1-25011	39	Steering Column	1
N.430851	17	Shim	1	N.430811	40	Bolt 5/16 "BSF	4
N.431231	18	Spherical Housing	1	N.430891	41	Earthing Connection	1
404-1-25005	19	Bracket	1	N.430481	42	Flexible Coupling	1
FB.105/28D	20	Bolt 5/16" BSF	1	-	43	Washer 5/16" dia.	4
N.717022	21	Insulating Tube	1	FN.405/K	44	Nut 5/16" dia. slotted	4
N.704097	22	Insulating Washer	2	-	45	Split Pin 1/16" dia. 1" long	4
-	23	Washer 5/16" Shakeproof	1				





TIE TUBE AND BALL JOINT ASSEMBLY WITH TELESCOPIC SLEEVE.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-23057	-	Tie Tube and Ball Joint Assy.	1	N.430271	15	Socket Bearing (inner)	2
404-1-23043	1	Tie Tube	1	N.430281	16	Ball Bolt (inner)	2
N.704123	2	End Socket (outer)	2	N.430291	17	Bearing Ring (inner)	2
N.430401	3	Ball Bolt (outer)	2	N.430301	18	Housing (inner)	2
N.430381	4	Socket Bearing (outer)	2	N.430321	19	Special Nut (inner)	2
N.430371	5	Spring for Outer Joint	2	N.430331	20	Locknut for special nut	2
N.430361	6	Shim Washers for outer Ball Joint	as reqd	N.430941	21	Packing Washer	2
N.430871	7	Bolt 5/16" BSF	2	N.430311	22	Spring (inner)	2
-	8	Washer 5/16" dia. MS.	2	N.430341	23	Locking Ring for special nut	2
FN.405/K	9	Slotted Nut 5/16" dia.	2	N.430351	24	Locking Nut - Tie tube to rack	2
-	10	Split Pin 1" x 1/16" dia.	2	N.430461	25	Clip - Sleeve to Tie Tube	2
N.430411	11	Oil Retaining Sleeve	2	N.430421	26	Telescopic Sleeve	2
-	12	Washer ½" dia.	2	-	27	Nut 4BA plain MS.	4
FN.408/K	13	Slotted Nut ½" BSF	2	N.430431	28	Clip - Sleeve to Box	2
-	14	Split Pin 3/32" dia. 1¼"	2	-	29	Screw 4BA Rd. head 7/8" long	4



Steering

Description

The steering, which is identical on the Type 404 and Type 405 Cars, is the rack and pinion type with tie tube assemblies connecting the steering rack to the steering arms. A flexible coupling connects the steering column to the steering box.

The assembly is bolted to the chassis front cross member Fig.116.

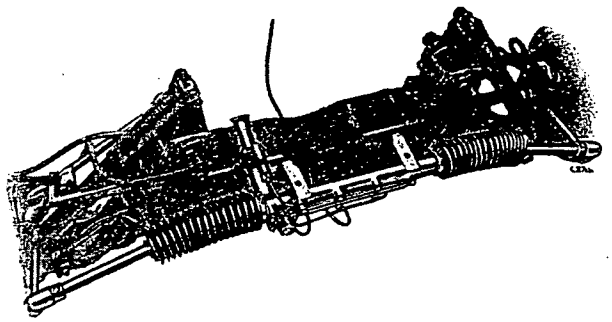


Fig. 116. Steering box and tie tubes

Replacements

No exchange reconditioning scheme is available for steering boxes.

Servicing

The steering box and tie tubes are lubricated by the 'one-shot' lubrication system.

Little attention is normally required and should any adjustments need to be made they can be carried out in situ. Referring to Fig.117, to take up backlash, slacken the two setscrews clamping the adjustment plate and move the plate as required. Tighten carefully and evenly. To take up end float, release the locknut of the adjuster screw at the base of the pinion.

Steering Wheel Adjustment

The steering wheel can be set to one of three positions. To adjust, turn the wheel until the bolt head and nut are accessible through the holes in the tubular fairing of the steering wheel. Remove the nut with a 5/16 inch box spanner and push out the bolt. Set the steering wheel to the selected groove in the column and insert and tighten the bolt.

In addition the steering column rake can be set in one of two alternative positions by means of the two sets of holes in the attachment bracket immediately below the dashboard.

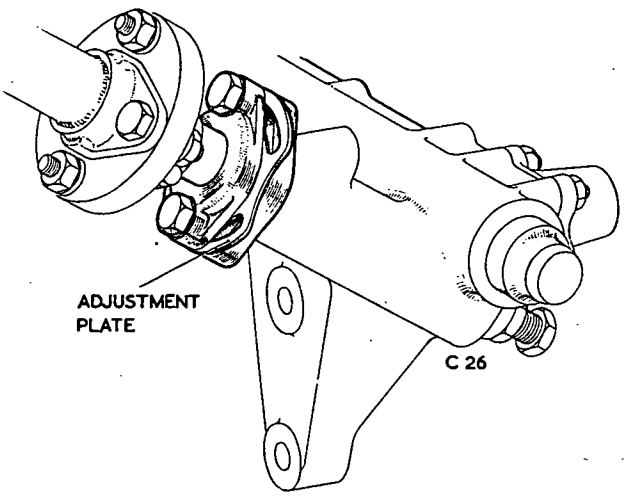


Fig. 117. Pinion adjustment plate

Removing the Steering Box

Raise and support the front of the car.

Disconnect the two lubrication pipes from the unions on the steering box and header, remove the pipe clip from the cover plate, and remove the pipes.

Remove the clips and withdraw the telescopic sleeves from each end of the steering box. Before loosening the tie tube locknuts count the number of threads exposed, in order to retain the tracking of the wheels, then slacken the locknuts and unscrew the inner ball bolts from the rack.

Withdraw the split pins and remove the nuts, bolts, and washers securing the steering column to the cross-head of the pinion. One end of the earthing connection is fitted beneath one of the nuts.

Remove the four 7/16 inch BSF bolts and washers attaching the steering box to the front cross member.

Dismantling the Steering Box Fig. 118.

Remove the nuts and spring washers and detach the cover plate and gasket. Pull out the locating bolt from the slot.

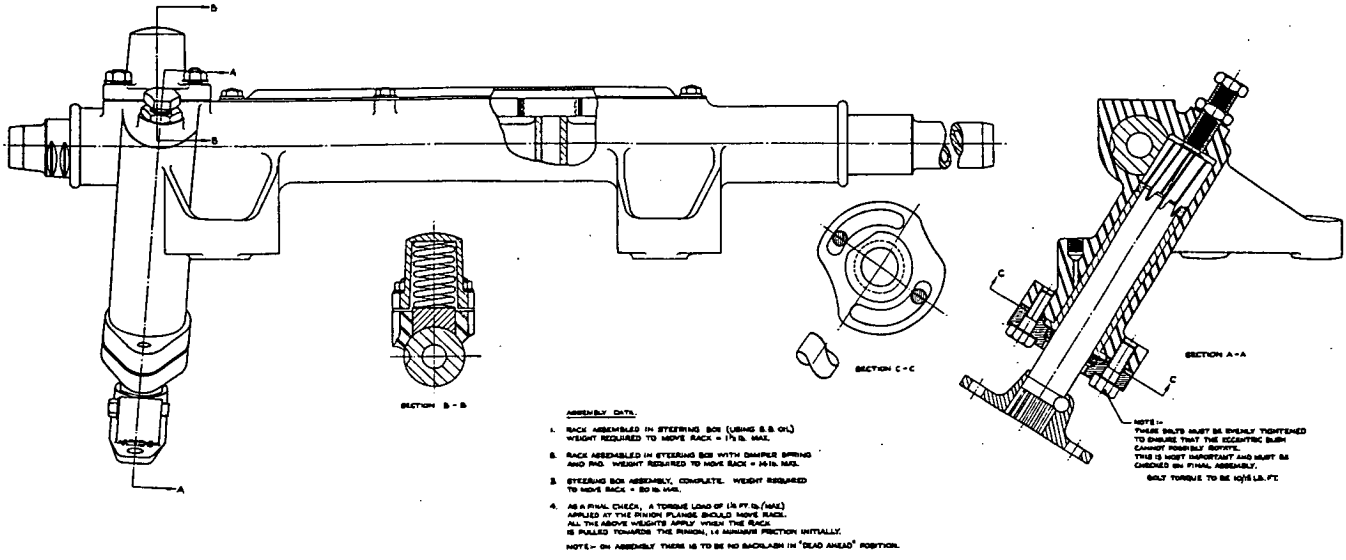


Fig. 118. Steering box assembly

Unscrew the damper cap nuts, evenly and diagonally to ease the tension on the spring, then remove the cap, gasket, spring and pressure block.

Remove the nut and washer, tap out the cotter pin then detach the crosshead from the serrations of the pinion shaft. Release the two 5/16 BSF set bolts and detach the retainer with its felt washer and the pinion adjusting plate.

Withdraw the pinion shaft complete with its eccentric bush and thrust washer. Remove the pinion shaft adjusting screw with its locknut and washer.

Finally remove the rack.

To Re-assemble the Steering Box

Ensure that all parts are serviceable and clean and that the oil passages are free from obstruction. Lubricate freely during assembly.

Assemble the rack to the steering box and see that it is a good sliding fit. Particular care should be taken if it should be a new steering box or rack, or both. Remove any high spots.

When satisfactory, well lubricate and slide the rack into position. Fit the hardened location bolt into the rack and slot and again test for freedom of movement.

It is essential that there is not more than .0035 inch slackness between the diameter of the pinion shaft and the bore of the eccentric bush. Fit the thrust washer and eccentric bush to the pinion shaft then fit them to the steering box engaging the teeth of the pinion with those of the rack. Fit the adjusting plate over the flats of the eccentric bush, fit the felt washer to the retaining plate, position them over the pinion shaft and insert the two 5/16 bolts with lockwasher and screw in sufficiently to allow the adjusting plate to be moved.

Fit the adjusting bolt with its locknut and washer and take up all end float of the pinion shaft, then tighten the locknut securely.

Turn the adjusting plate to take up any backlash between the teeth of the rack and pinion, then tighten the two bolts evenly to a torque loading of 10 to 15 lb. ft. (14.88 to 22.32 Kg/m) and lock with the tabwashers.

Check that the assembly can now be moved steadily without slack and without strain.

Fit the tufnol damper pressure block followed by its spring damper cap and gasket. Secure with the four nuts, plain and shakeproof washers. Tighten evenly.

Fit the cover plate and gasket, spring washers and nuts and tighten evenly.

Slide the crosshead on to its serrations, tap in the cotter pin, fit the washer and nut and tighten.

Refitting the Steering Box to the Chassis

Secure the steering box to the cross member with the four 7/16 BSF bolts and spring washer and tighten at the same time checking that the pinion shaft does not tighten beyond its torque loading of 1.1/2 lb. ft. If it does tighten find the screws which are causing the distortion and check, with feelers, the amount of packing required. Shims .002 inch and .003 inch are available to insert between the faces at the bolt holes.

When this is satisfactory, screw the inner ball bolt of each tie rod into the rack to the setting, ie, number of threads, noted prior to removal. Tighten the locknuts and check through the 1/8 dia. inspection hole at each end to see that the ball bolt thread is not less than this point.

Fit the telescopic rubber sleeves and connect the two lubrication pipes to the steering box and header attaching the pipe clips to the stud of the cover plate.

Finally re-connect the flexible coupling to the pinion crosshead, fitting the earthing connection beneath one of the nuts.

The steering wheel will have to be re-aligned on its splines to give the 'dead ahead' position for the spokes. The tracking of the wheels should be checked.

Removing the Tie Tubes

Withdraw the split pin, remove the slotted nut and the washer securing each tie tube to the steering arm. Separate the taper joint using extractor TFN.5006.

Release the clips and withdraw the telescopic sleeves from the steering box.

Note the position of the inner ball bolt locking nuts by counting the threads which are visible. This will retain the tracking position on re-assembly. Release the locknuts and unscrew the ball bolts from the steering rack.

Dismantling the Tie Tubes

Refer to Fig.119. Remove the split pin, nut, washer and special bolt and take off the outer end socket complete with ball bolt and oil retaining sleeve. Remove the oil retaining sleeve and withdraw the ball bolt. Remove the outer socket bearing, spring and shims from the tie tube.

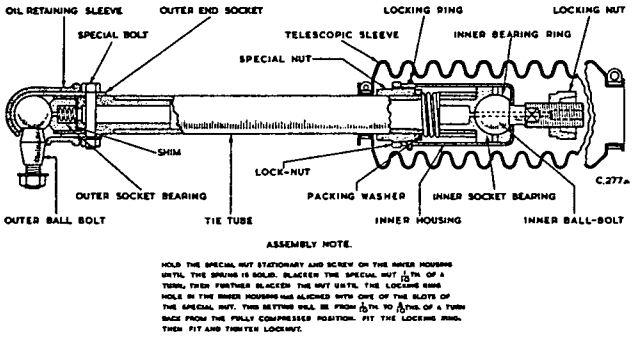


Fig. 119. Tie tube assembly

Loosen the clip and slide off the telescopic sleeve. Release the locknut, remove the locking ring and unscrew the inner housing.

Remove the locking nut from the inner ball bolt and push out the ball bolt and its inner bearing ring.

Inspection of Parts

The ball bolt and sockets are the most important points. In manufacture they are ground and lapped to give a high percentage of bearing surface, and every effort should be made to maintain this finish since failure to do so will have a detrimental effect on the steering. Replace parts if they are badly grooved.

Re-assembly of the Tie Tubes

Lubricate the parts freely during assembly. Locate the inner spring, packing washer and the special nut over the tie tube, in that order, and locate the spring against the ferrule.

Fit the inner bearing ring to the inner housing, pass the thread end of the ball bolt through and screw on the locking nut. Insert the inner socket bearing into the tie tube. To complete the assembly this end see the note on Fig.119.

Slide the rubber telescopic sleeve, large end first, over the tie tube.

Fit the outer ball bolt into the end socket and then fit the oil retaining sleeve.

Assemble the outer socket bearing and its original shims but without the spring to the end of the tie tube, then fit the outer socket and ball bolt. Check the alignment of the bolt holes in the socket and tie tube. The thickness of the shims must be adjusted so that there is no clearance between the ball bolt and its seating when the bolt is inserted.

Dismantle the parts and re-assemble with the correct thickness of shims and with the spring in position. Fit the bolt and lock with a split pin.

On this final assembly load the tie tube with approved oil.

Refitting the Tie Tubes

Screw the inner ball bolt into the steering rack to the setting ie, number of threads, noted prior to removal. Tighten the locknut and check through the 1/8" dia. inspection hole Fig.120 to see that the ball bolt thread is not less than this point.

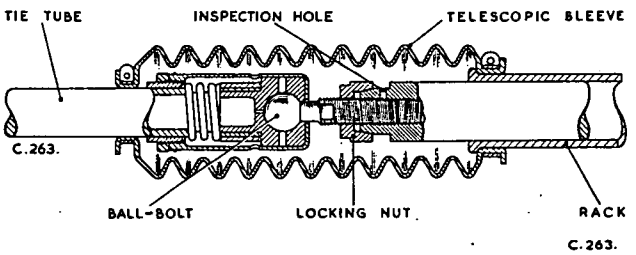


Fig. 120. Inspection hole—tie tube

Fit the telescopic sleeves. Fit the outer ball bolts to the steering arms and lock with a split pin.

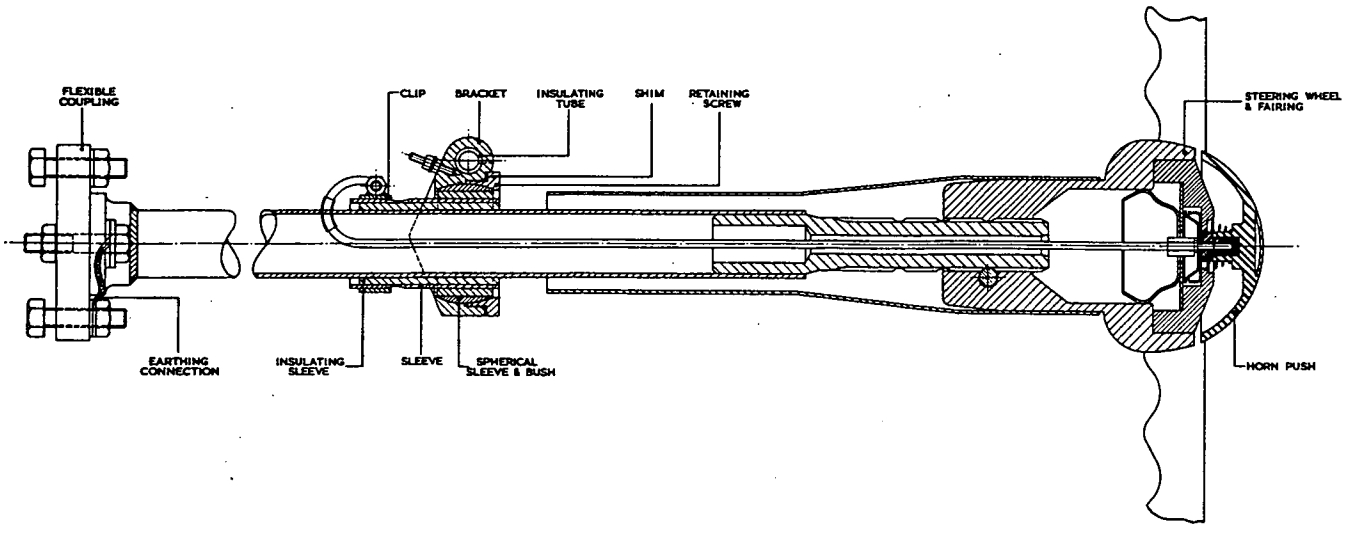
The tracking of the wheels should be checked.

Adjusting the Steering Column Bracket

Referring to Fig.121 the steering column bracket can be adjusted in situ. by adding or removing the shims underneath the head of the retaining screw.

To take off the steering wheel, withdraw by hand the horn push button from the centre of the wheel and disconnect the cable. Remove the bolt from within the steering column fairing and slide the wheel and fairing off of the serrated column.

To adjust the bracket use a close fitting 'C' spanner similar to TFN.5028.



121. Steering column assembly

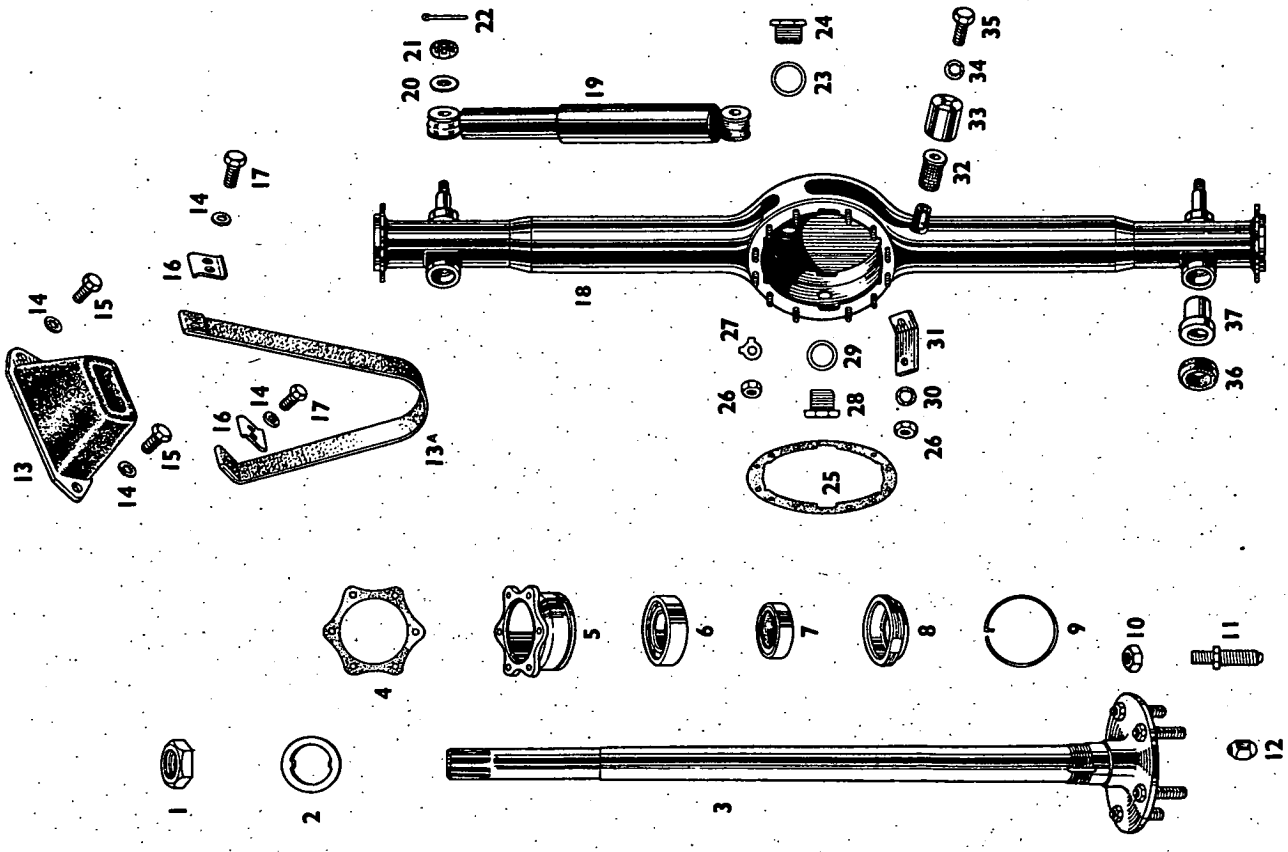
Rear Suspension

List of Contents

Rear Suspension

TYPE 404. REAR HALF SHAFTS AND AXLE CASING.

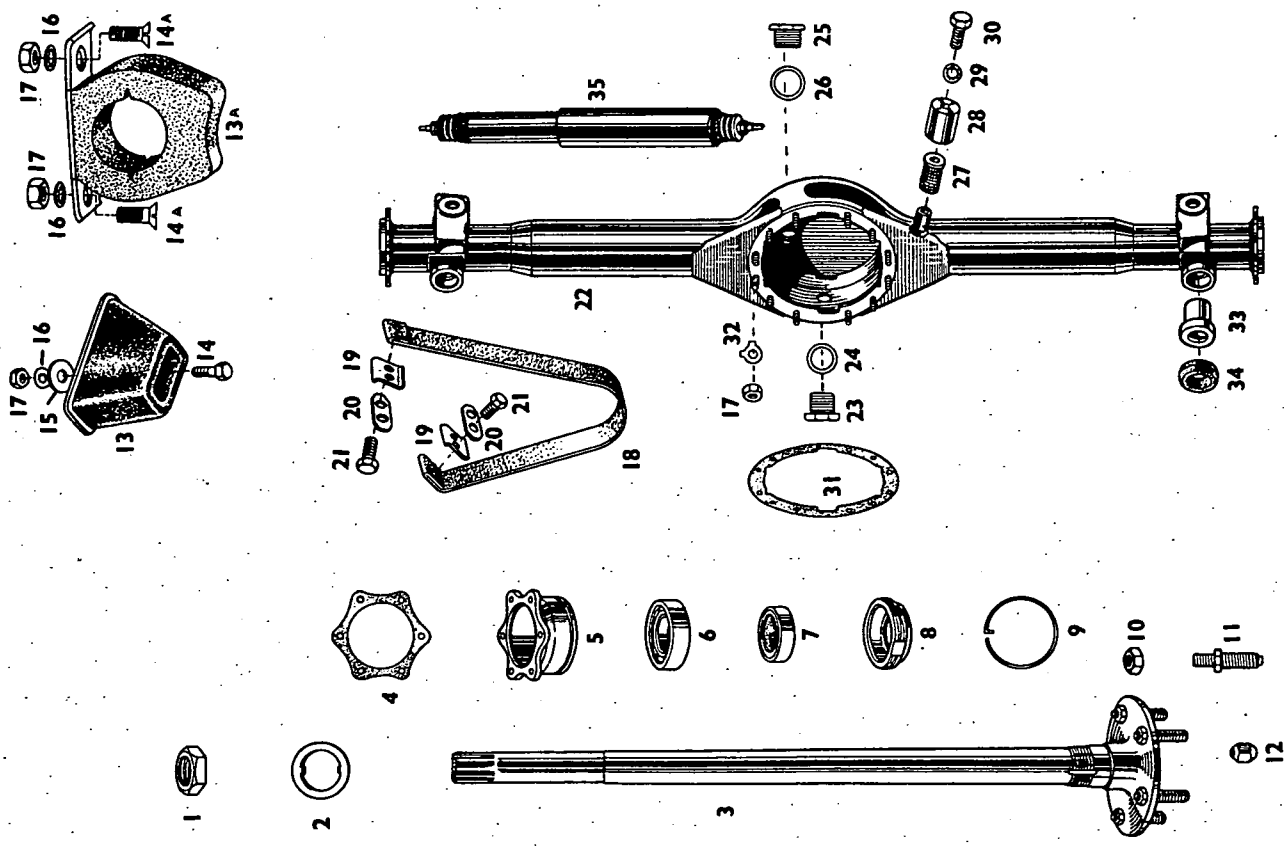
Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.501351	1	Retaining Nut R.H.	1	404-1-30008	18	Rear Axle Casing	1
N.501361	-	Retaining Nut L.H.	1	404-1-20114	19	Rear Telescopic Shock Absorber (Girling)	2
N.501371	2	Lockwasher	2	404-1-20124	-	Rear Telescopic Shock Absorber (Armstrong)	-
404-1-30030	3	Half Shaft L.H. complete with Wheel Studs	1	404-11-20153	-	Rear Telescopic Shock Absorber (Telaflo)	-
404-1-30031	-	Half Shaft R.H. complete with Wheel Studs	1	404-1-20116	20	Washer - Rear Shock Absorber	4
N.501431	4	Gasket	4	FN.408/L	21	Nut ½" BSF	4
N.501411	5	Bearing Housing R.H.	1	-	22	Split Pin 3/32" dia. 1¼" long	2
N.501421	-	Bearing Housing L.H.	1	N.501671	23	Gasket for Filler Plug	1
N.501501	6	Ball Race	2	N.501651	24	Filler Plug	1
L.719039	7	Oil Sealing Ring	2	N.502251	25	Gasket	1
N.501381	8	Retaining Ring R.H.	1	FN.105/K	26	Nut 5/16" BSF	13
N.510391	-	Retaining Ring L.H.	1	AGS.195/2	27	Tabwasher	12
N.502441	9	Locking Ring	2	N.501641	28	Drain Plug	1
FN.208/K	10	Nut ½" BSF Thin	10	N.501661	29	Gasket for Drain Plug	1
404-1-23041	11	Wheel Stud	10	-	30	Shakeproof Washer 5/16" dia.	1
N.580031	12	Wheel Nut	10	404-1-24038	31	Attachment Plate for 3 way Union	1
404-1-20112	13	Snubber Block	2	N.501271	32	Screen for Ventilator	1
404-1-20109	13A	Snubber Strap	2	N.501291	33	Cap for Ventilator	1
-	14	Shakeproof Washer ¼" dia.	12	-	34	Shakeproof Washer 2BA	1
S.104/4D	15	Setscrew ¼" BSF	4	-	35	Screw 2BA Hex Hd ½" long	1
620311	16	Washer Plate	2	N.501211	36	Sealing Ring	2
S.104/8D	17	Setscrew ¼" BSF	8	N.501201	37	Bush	2



TYPE 405. REAR HALF SHAFT AND AXLE CASING.

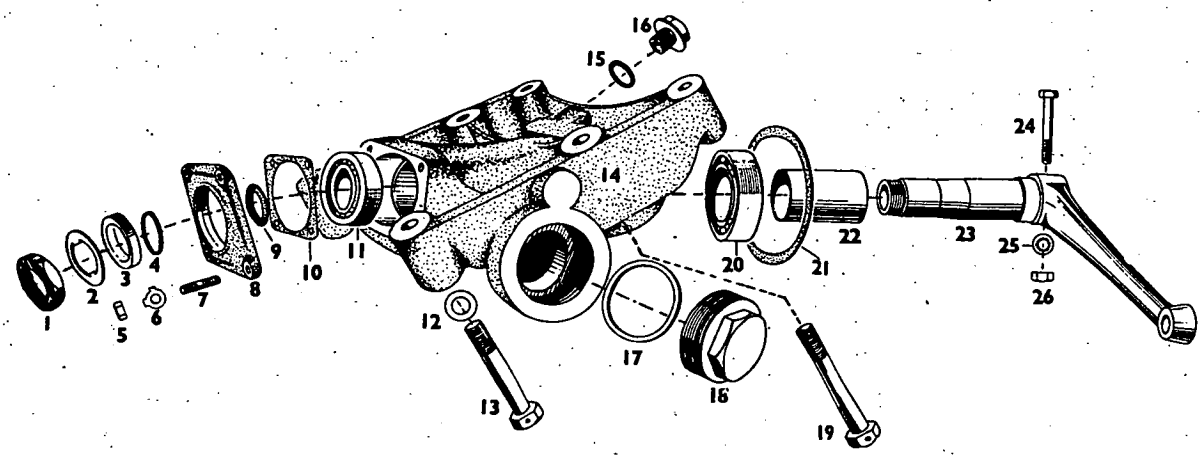
Part No.	Item	Description		No. off per car
N.501351	1	Retaining Nut R.H.	)	1
N.501361	-	Retaining Nut L.H.	) Used	1
405-1-30063	2	Lockwasher	)	2
404-1-30030	3	Half Shaft L.H. complete with Studs	) up to	1
404-1-30031	-	Half Shaft R.H. complete with Studs	)	1
N.501431	4	Gasket	) Chassis	4
N.501411	5	Bearing Housing R.H.	)	1
N.501421	-	Bearing Housing L.H.	) 4171	1
N.501501	6	Ball Race - Brass Cage	)	2
405-1-30065	1	Retaining Nut R.H.	)	1
405-1-30066	-	Retaining Nut L.H.	) Used	1
-	2	No Lockwasher used	)	-
405-1-30059	3	Half Shaft L.H. complete with Studs	) on and	1
405-1-30060	-	Half Shaft R.H. complete with Studs	)	1
N.501431	4	Gasket	) after	4
405-1-30055	5	Bearing Housing L.H.	) Chassis	1
405-1-30056	-	Bearing Housing R.H.	)	1
405-1-30061	6	Bearing - Halfshaft	) 4172	2
405-1-30062	7	Oil Seal		2
N.501381	8	Retaining Ring R.H.		1
N.501391	-	Retaining Ring L.H.		1
N.502441	9	Locking Ring		2
FN.208K	10	Nut ½ BSF - Thin		10
404-1-30032	11	Wheel Stud		10
N.580031	12	Wheel Nut		20

Part No.	Item	Description		No. off per car
405-1-20119	13	Bump Stop	) Used	2
FS.105/5D	14	Setscrew 5/16" BSF 5/8" long	) up	4
AGS.157E	15	Washer 5/16" large o/d	) to	4
-	16	Washer 5/16" Shakeproof	) Chassis	4
FN.105/K	17	Nut 5/16" BSF Plain	) 4136	4
405-1-20152	13A	Bump Stop	) Used	2
-	14A	Screw 5/16" BSF Csk. 5/8" long	) on and	4
FN.105/K	-	Nut 5/16" BSF	) after	
-	-	Washer 5/16" Shakeproof	) Chassis 4137	4
405-1-20114	18	Rear Check Strap		2
N.620311	19	Washer Plate		4
-	20	Shakeproof Washer ¼" dia.		8
FB.104/8D	21	Bolt ¼" BSF x 1" long		8
405-1-30001	22	Rear Axle Casing		1
N.501641	23	Drain Plug		1
N.501661	24	Drain Plug Gasket		1
N.510651	25	Filler Plug		1
N.501671	26	Filler Plug Gasket		1
N.501271	27	Screen for Ventilator		1
N.501291	28	Cap for Ventilator		1
-	29	Washer 2BA Shakeproof		1
-	30	Screw 2BA Hex. Hd. ½" long		1
N.502251	31	Gasket - Diff. to Axle Casing		1
AGS.195/2	32	Tabwasher		12
N.501201	33	Bush		2
N.501211	34	Sealing Ring		2
405-1-30023	25	Rear Shock Absorber		2



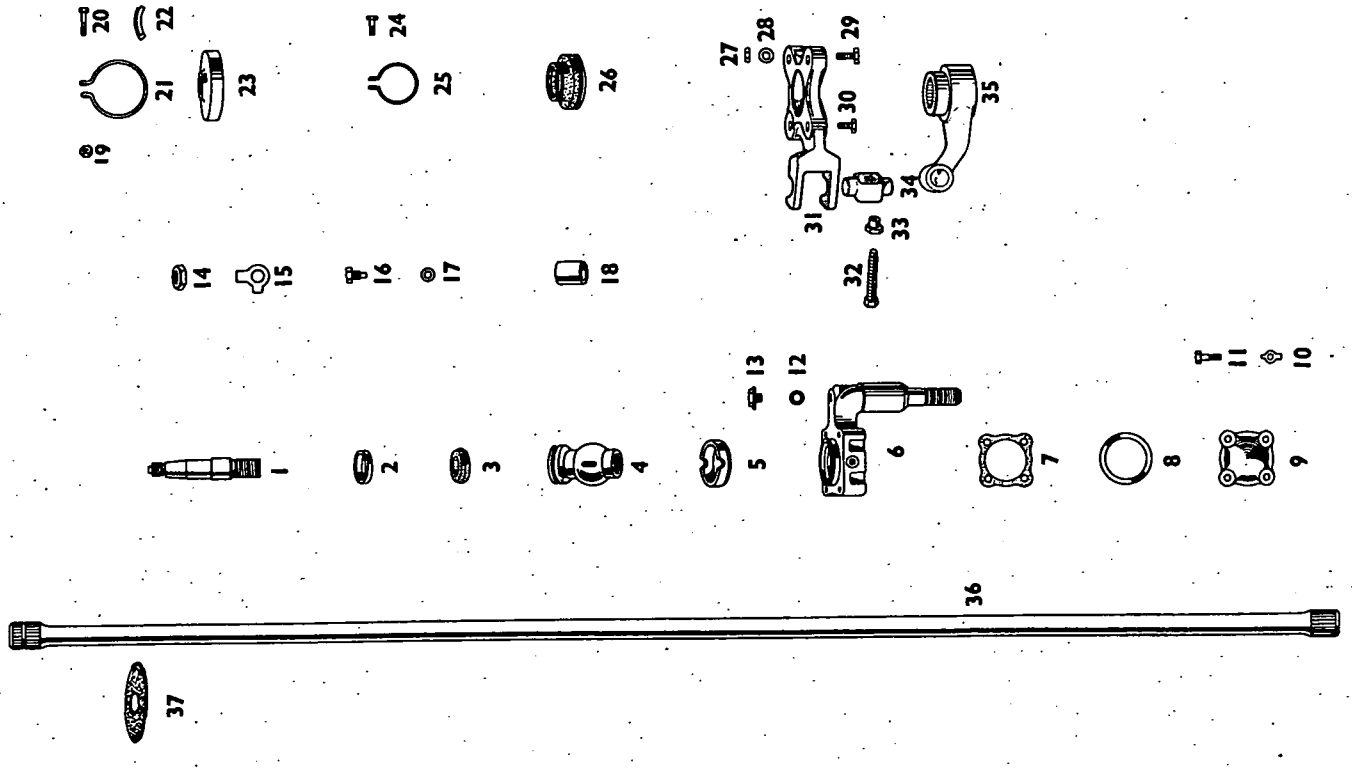
TYPE 405. REAR SUSPENSION UNIT.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-30007	-	Assy of Rear Suspension Unit	2	N.719014	14	Suspension Unit Body	2
N.502451	1	Special Nut	2	N.420401	15	Fibre Washer	2
N.500381	2	Lockwasher	2	N.420091	16	Filler Cap	2
N.500411	3	Oil Seal Spacer	2	N.420351	17	Washer	4
N.500161	4	OileSeal Ring - Small	2	N.420191	18	Cap	4
FN105/K	5	Nut 5/16" BSF	16	404-1-20164	19	Bolt - FB107/24D	4
N.420471	6	Tabwasher	16	N.500451	20	Needle Roller Race	2
N.500321	7	Cover Plate Stud	16	N.500421	21	Cover Plate Gasket	4
N.500141	8	Cover Plate	4	N.500621	22	Distance Piece	2
N.500151	9	Oil Seal Ring	4	404-1-30006	23	Mainshaft and Arm	2
N.500581	10	Cover Plate Gasket	4	FB105/20D	24	Bolt 5/16" BSF	2
N.500461	11	Ball Race	2	-	25	Washer 5/16" BSF	2
-	12	Washer 7/16" Plain	12	FN105/K	26	Nut 5/16" BSF	2
404-1-20163	13	Bolt - FB107/19D	8				



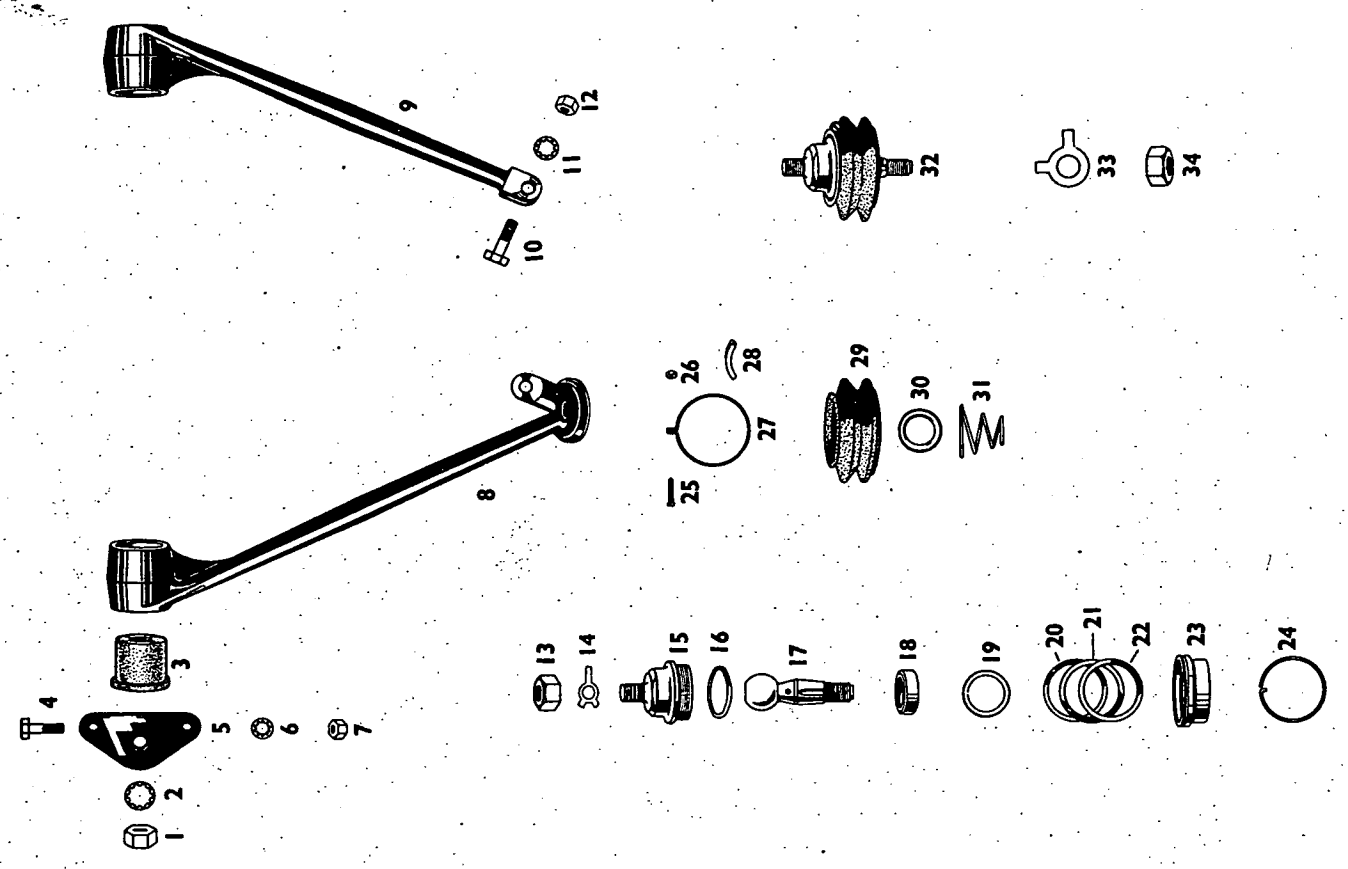
TYPE 405. SUSPENSION ARM AND TORSION BAR.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.500041	-	Suspension Arm Assy	2	-	20	2BA Bolt 1" long	2
N.500211	1	Suspension Arm Shaft	2	N.500331	21	Large Spring Clip	2
N.500301	2	Oil Seal Locating Ring	2	N.500351	22	Saddle Piece	4
N.500291	3	Oil Seal Ring	2	N.500282	23	Cover for Oil Retainer	2
N.500241	4	Ball Sleeve with Bush) paired	2	-	24	2BA Bolt 5 "long	2
N.500251	5	Ball Sleeve Housing)	4	N.500341	25	Small Spring Clip	2
N.500111	6	Suspension Arm	2	N.500261	26	Flexible Oil Retainer	2
N.500441	7	Gasket	2	FN107/L	27	7/16" BSF Nut	6
N.500571-2	8	Shim .002 thickness	as reqd.	-	28	7/16" Shakeproof Washer	8
N.500571-3	-	Shim .003 thickness	as reqd.	FB.107/9D	29	7/16" BSF Bolt	6
N.500571-4	-	Shim .010 thickness	as reqd.	FB.106/5D	30	7/16" BSF Bolt	2
N.500271	9	Cap for Suspension Arm	2	N.704126B	31	Anchor Bracket RH	1
N.500561	10	Tabwasher	8	N.704126A	-	Anchor Bracket LH	1
FB.104/8D	11	Bolt 1/4" BSF 1" long	8	N.704129	32	Adjusting Screw	2
N.500541	12	Fibre Washer	2	N.704128	33	Locknut	2
N.500551	13	Flanged Plug	2	N.704130	34	Swivel Nut	2
FN210/K	14	Nut thin 5/8" BSF	2	N.704127	35	Torque Arm	2
N.500361	15	Lock Washer	2	404-1-30002	36	Torsion Bar LH) Type 404	1
N.500431	16	Ball Sleeve Stop Pin	4	404-1-30003	-	Torsion Bar RH)	1
N.420381	17	Fibre Washer	4	405-1-30016	-	Torsion Bar LH) Type 405	1
N.500231	18	Bush for Ball Sleeve	2	405-1-30017	-	Torsion Bar RH)	1
-	19	2BA Nut	4				



TYPE 405. REAR BALL JOINT ASSEMBLY AND ATTACHMENT UNIT.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
FN.108/K	1	Nut ½" BSF	2	N.501711	17	Ball Bolt	1
-	2	Washer Shakeproof ½"	2	N.501721	18	Socket Bearing - Ball Bolt	2
N.502241	3	Bearings	4	N.502111	19	Shim .002	as reqd.
FB.105/8D	4	Bolt 5/16" BSF	4	N.501751	20	Shim .020	as reqd.
N.620021	5	Washer Plate (Attachment Unit)	2	N.501761	21	Shim .005	as reqd.
-	6	Washer Shakeproof 5/16" Dia.	4	N.502101	22	Shim .002	as reqd.
FN.105/K	7	Nut 5/16" BSF	4	N.501741	23	Housing Inside Thread	1
404-1-30001-1	8	Major Arm) Type 404	1	N.501781	24	Locking Ring for Housing	1
404-1-30001-2	9	Minor Arm)	1	-	25	Screw 4BA 3/4" long	2
N.719044	-	Major Arm) Type 405	1	-	26	Nut 4BA plain	2
N.719043	-	Minor Arm)	1	N.501821	27	Wire Clip	1
FB.106/9D	10	Bolt 3/8" BSF	1	N.500351	28	Saddle Piece	1
-	11	Washer - Shakeproof 3/8" Dia.	1	N.502161	29	Rubber Oil Seal	1
FN.106/K	12	Nut 3/8" BSF	1	N.502171	30	Spring Cup	1
FN.109/K	13	Nut 9/16" BSF	1	N.501791	31	Spiral Spring	1
N.502131	14	Tabwasher	1	N.502371	32	Rear Ball Joint Assembly	1
N.501771	15	Housing Outside Thread	1	N.502191	33	Angle Tabwasher	1
N.502121	16	Shim .005	as reqd.	FN.110/K	34	Nut 5/8" BSF	1



Rear Suspension

Rear Suspension

This section covers the Axle casing, half shafts and hubs, suspension arms, suspension units, torsion bars and triangular attachment bracket attaching the top of the differential unit to the chassis frame.

The rear suspension for the Type 404 is shown in Fig. 122 and for the Type 405 in Fig. 123 and while they are basically the same the telescopic shock absorber attachment points to the rear axle are different.

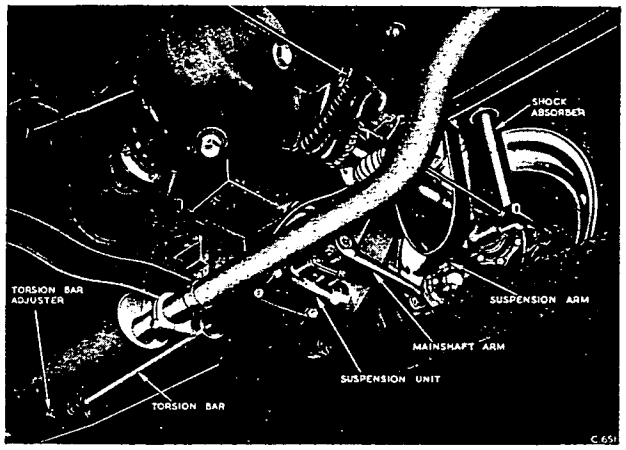


Fig. 122. Type 404 rear suspension

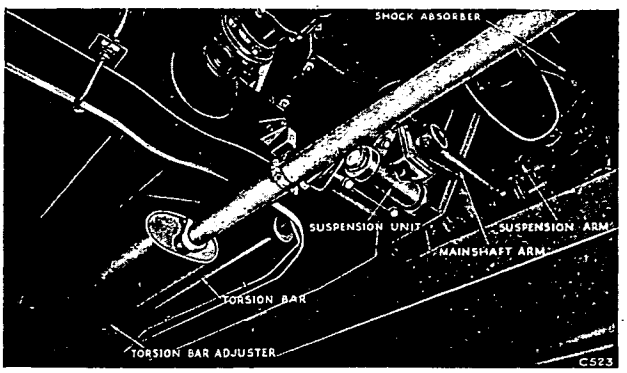


Fig. 123. Type 405 rear suspension

Removing Rear Axle Complete

Jack up the car and support with chassis stands under the chassis frame side members, well towards the rear wheels.

Remove both rear wheels.

Jack up and support the axle casing and detach the rear attachment bolts of the snubber straps.

Detach the lower end of the telescopic shock absorbers.

Manipulate the jack until the axle is in a neutral position i.e. with no load on the torsion bars.

Referring to Fig.124 detach the attachment unit from the top of the differential unit.

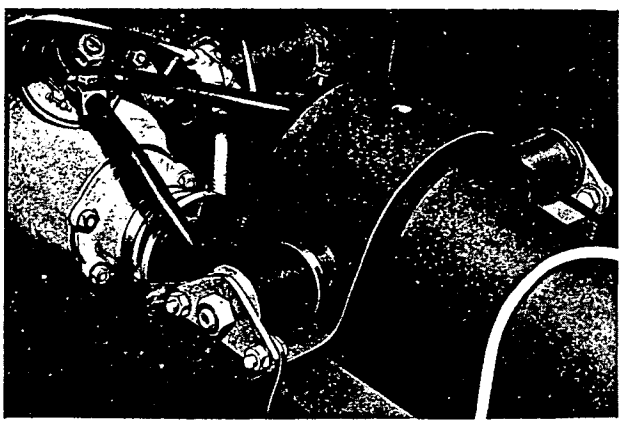


Fig. 124. Attachment unit

Disconnect the rear universal joint of the propellor shaft.

Disconnect the brake fluid flexible pipe.

Detach the gaiter and disconnect the handbrake operating connection to the brake operating lever.

Unlock the tabwasher and remove the nut, then using extractor TFN.8039 as shown in Fig.125 break the taper joint between the suspension unit mainshaft arms and the suspension arm shafts. Do not turn the suspension arm shafts since this is the adjustment for the rear tracking.

The axle casing can now be removed from the car.

Refitting the Axle

First check the position of the suspension arms relative to the faces of the phosphor bronze bushes in the axle casing. This should give 1/16 inch (1.59 m/m) clearance as shown in Fig.126 when the arm is hanging

downwards and the end of the suspension arm shaft is level with the back of the ball sleeve. This setting is important since it forms the initial setting for the tracking.

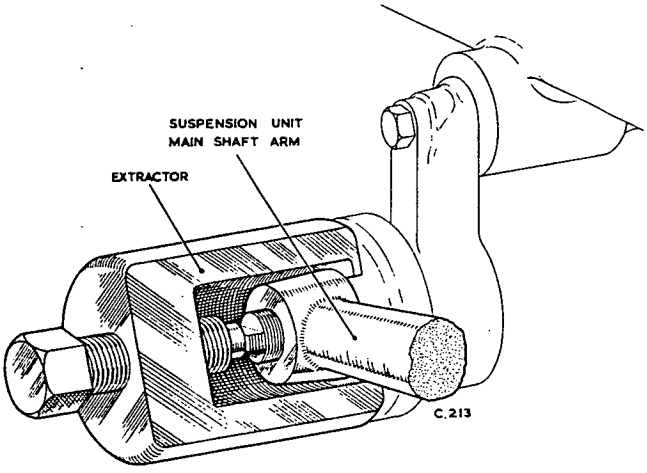


Fig. 125. Suspension arm shaft extractor

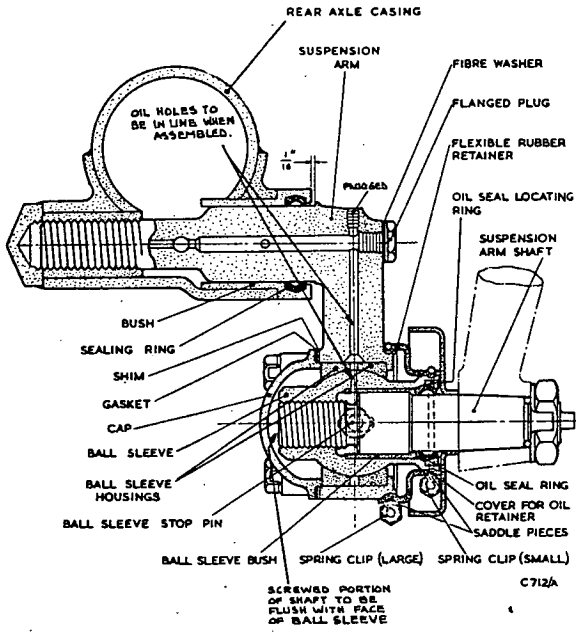


Fig. 126. Suspension arm (section)

With the axle below its location in the car, jack it up until the suspension arm tapers can be located in their respective mainshaft arms. Fit a tabwasher and tighten but do not lock the tabwashers until the final alignment check has been made.

Connect the attachment unit to the joint at the top of the differential housing fit a tabwasher tighten and lock.

Re-connect the rear joint of the propellor shaft.

Refit the brake fluid flexible pipe and the hand brake connection to the brake lever followed by its protective gaiter.

Reconnect the rear of the snubber strap and then the telescopic shock absorbers.

Refit the wheels and lower the car.

Bleed the brake system and carry out an alignment check.

Attachment Unit

The rear suspension is stabilized by the triangular attachment unit which is secured to the ball joint at the top of the differential gear housing and is pivoted laterally to the top of the chassis frame cross member, Fig.124.

Little attention is needed at these points but if, after considerable time, the four rubber bushes at the chassis attachment require replacement they can be removed by detaching the plate shown in the illustration held in position by two small and one large nut.

When fitting new rubber bushes coat them inside and out with colloidal graphite.

Axle Casing

The axle casing itself required little attention but in the event of damage a check for alignment may be necessary and dimensioned drawings of the Type 404 and Type 405 Axle Casings are given in Fig.127 and Fig.128.

A small breather unit is situated on the top left hand side of the casing.

A replaceable phosphor bronze bush near each end of the casing is grooved to receive an oil sealing ring and locates the suspension arms.

Replacing the Phosphor Bronze Bushes

Remove the old bush and dress any withdrawal scores in the casing. There are two methods of replacing a bush:-

Method (a).....without special tools.

Method (b).....with special tools.

Method (a).

If freezing facilities are available, freeze and insert the bush, if these facilities are not available press in the bush.

Using a standard 1.3/16 (1.1875) inch dia. reamer carefully ream the diameters to size. If this is carried out carefully the bush bore and the rear threaded portion should align. Test this, and carefully scrape, if necessary, by screwing in the suspension arm before the rubber oil seal is fitted.

Method (b).

Enter the bush slightly into the bore and pull the bush

into position using the tool TFN.5067. Remove the tool and insert the pilot of the reamer TFN.4662. Locate the reamer over the pilot and ream the bush bore. This assures alignment of the bore with the threaded portion. Check with the suspension arm before the rubber seal is fitted.

Removing the Half Shaft Assembly from the Axle Casing

Jack up the car, remove the road wheel, remove the brake drum by releasing the two countersunk screws. From behind the backplate, release the tabwashers and remove the six bolts.

Withdraw the half shaft complete with bearing housing then fit a temporary nut and bolt to secure the backplate to the axle flange Fig.129.

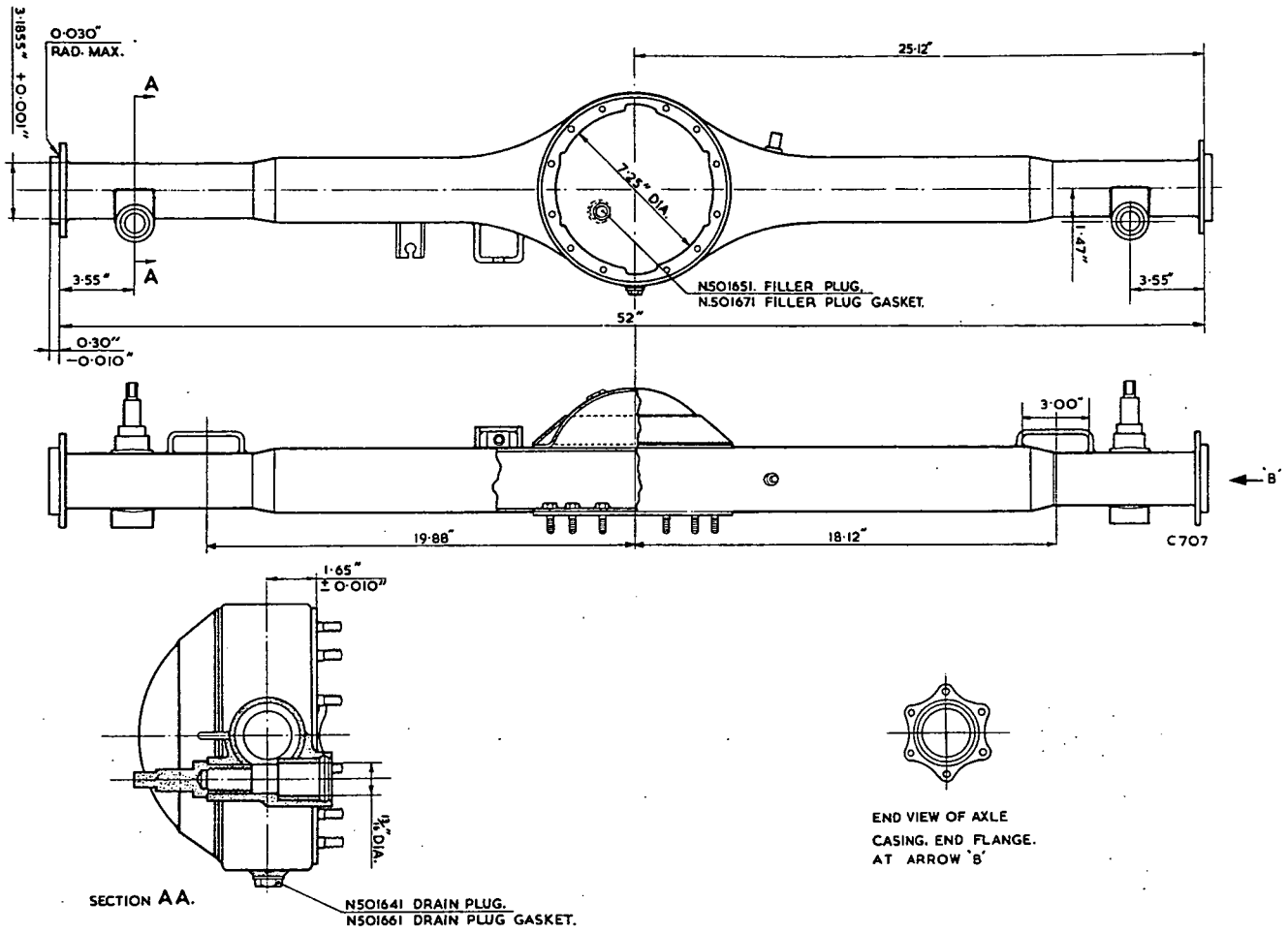


Fig. 127. Type 404 rear axle casing

Fitting Rubber Oil Seal

With both methods of sizing the bush, remove the sharp edges and clean the bore thoroughly. Apply colloidal graphite to a new oil seal and fit into the recess of the bush.

Half Shafts

The half shafts used on all Type 404 Cars and on Type 405 cars up to Chassis 4171 are fitted with a single row ball race (brass caged) R & M. LJ.40 (3 spot). On Chassis 4172 and onwards a double row race R & M. LDJ40 was fitted with redesigned hubs and half shafts. Basically the assembly of the parts is unchanged.

Withdraw the half shaft complete with bearing housing then fit a temporary nut and bolt to secure the backplate to the axle flange Fig.129.

To Replace Ball Race or Oil Seal

On all Type 404 Cars and on Type 405 Cars up to Chassis 4171 bend back the lockwasher fitted to the hexagon nut in the recess of the bearing housing.

On Chassis 4172 there is no lockwasher fitted but the nut is deeper and is assembled considerably tighter.

Using special spanner TFN.5022 and with the half shaft vertically located on its wheel studs, in vice plate

TFN.5084, slacken and remove the nut. The right hand shaft has a right hand thread and the left hand shafts a left hand thread.

No.44 Drill. Drill for depth carefully otherwise the drill will penetrate into the oil seal.

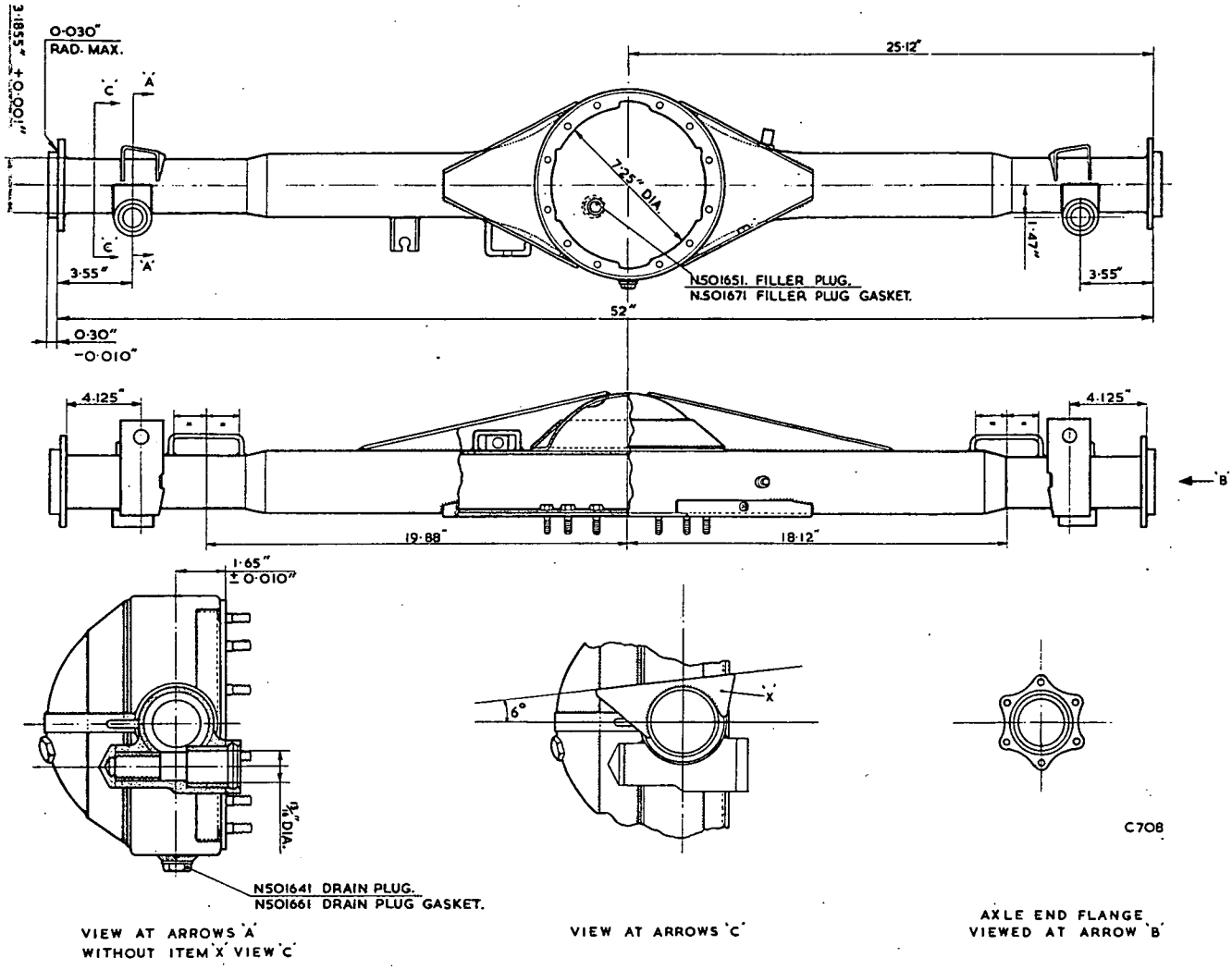


Fig. 128. Type 405 rear axle casing

Supporting the bearing housing, press or carefully drive the half shafts out, this is held in the housing by the interference fit of the ball race to the shaft.

Remove the external wire lock ring from the bearing housing and using spanner TFN.5023 and vice plate TFN. 5085 unscrew the retaining ring. Again the right hand side has a right hand thread and the left hand side a left hand thread.

Press the oil seal from the retaining ring and the ball race from the bearing housing.

To re-assemble inspect the ball race location in the housing, remove and scores or burrs and press in the ball race to its shoulder. Press a new seal into the retaining ring with the open end upwards. Screw the assembled retaining ring into the housing and tighten using the special spanner and vice fixture. If the existing locking holes in the housing and retaining ring do not register drill a new hole half way into the retaining ring using a

Press the half shaft into the ball race of the bearing housing assembly until the face of the race is tight against the shoulder of the shaft.

On all Type 404 Cars and on Type 405 Cars up to Chassis 4171 proceed as follows:

Fit a lockwasher 405-1-30063 and screw on and tighten the hexagon retaining nut using the special spanner and vice plate. Bend up two sides of the lockwasher using tool TFN.5024.

On Type 405 Car Chassis 4172 and onwards no lockwasher is fitted but it is essential that the hexagon nut is tightened to a torque loading figure of 500-580 lb. ft. If the special spanner TFN.5022, fitted with its extensions, and vice plate TFN.5084, is used then this approximate torque figure can be obtained.

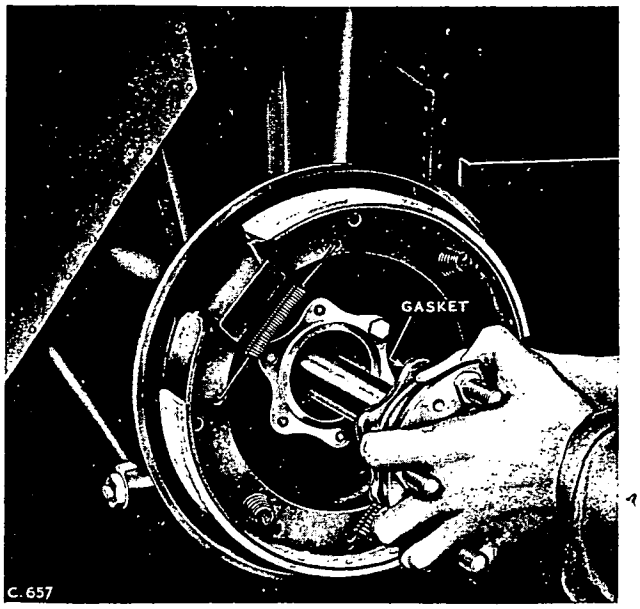


Fig. 129. Withdrawing half shaft assembly

To Refit the Half Shaft Assembly to the Axle Casing

Remove the temporary nut and bolt previously fitted to hold the brake backplate in position and fit a new joint N.501431 to the inner and outer faces of the backplate.

Insert the half shaft assembly and using new tabwashers N.501441 with the special bolts, secure the bearing housings. Lock the bolts with the tabwashers.

Refit the brake drum and road wheel.

Replacing Wheel Studs

Remove the peening which secures the locknut and remove the nut. The flange is threaded and to avoid damage when unscrewing the stud saw the peened end of the stud away. Screw the stud out carefully.

Screw in the new stud, fit and tighten the locknut and finally peen.

Suspension Units

This unit was filled with oil on earlier cars but is now packed with grease. Apart from the deterioration of the rubber oil seals at each end of the main shaft and arm they need little attention.

Should there be an oil leakage to the extent that they would become dry remove the units dismantle and reassemble with new rubber seals and at the same time pack with grease.

To Remove the Suspension Units

Jack up the car and support on chassis stands well towards the rear wheels.

Jack up the axle until the torsion bars are relieved of all strain.

Unlock the tabwasher and remove the nut, then using extractor TFN.8039 as shown in Fig.125 break the taper joint. Do not turn the suspension arm shaft since this is the adjustment and setting for the rear tracking.

Remove the 5/16 bolt from the top of the mainshaft arm. This bolt retains the torsion bar. Using extractor TFN5026 Fig.130 withdraw the torsion bar from the serrations in the suspension unit. Withdraw the torsion bar from under the axle noting the circular rubber stone guard Fig.131.

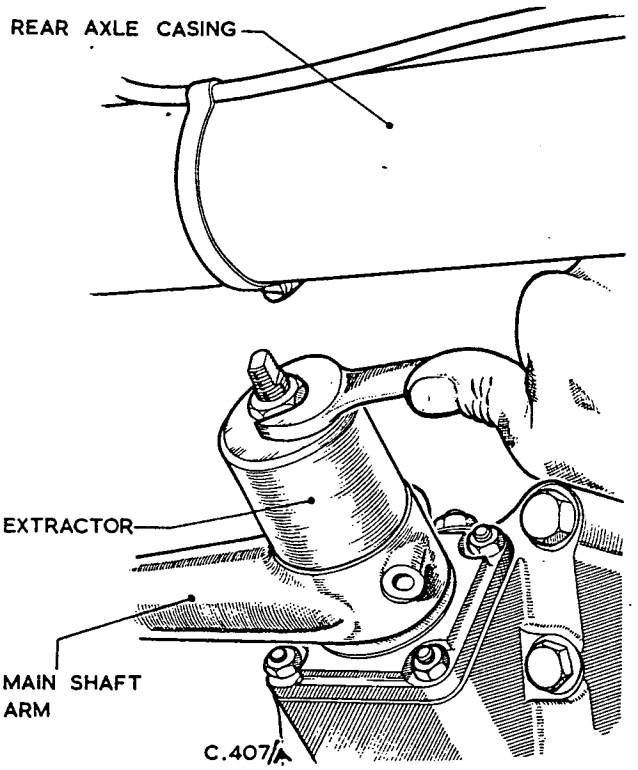


Fig. 130. Torsion bar extraction

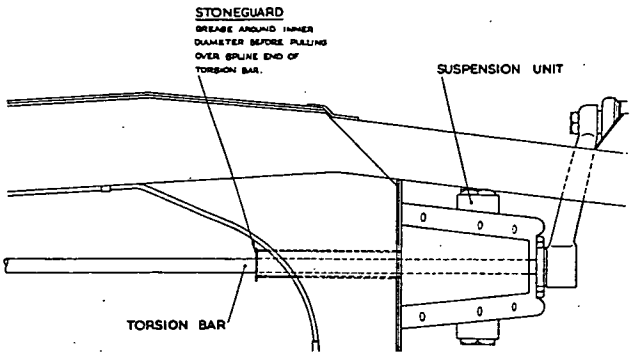


Fig. 131. Torsion bar stoneguard

Remove the wire locking and remove the bolts securing the suspension unit to the chassis frame.

Dismantling and Re-assembly

See Sectional view Fig.132.

Remove the filler plug and drain any oil from the casing.

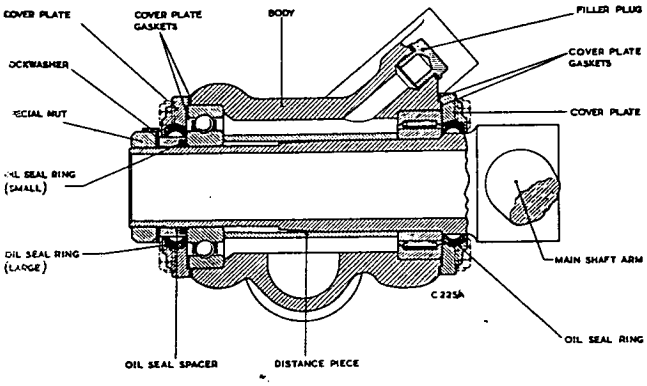


Fig. 132. Suspension unit (section)

Release the lockwasher and remove the special nut from the rear end of the mainshaft. The mainshaft is now only held in position by its interference fit in the bearings.

Release the tabwashers and remove the nuts securing the cover plates.

Taking care not to damage the threads drive the mainshaft out of the casing, this will leave the ball race and the outer race of the needle roller bearing, with its needles, in the casing.

The inner race of the needle roller bearing will remain on the mainshaft and should be pressed off to release the cover plate with its oil seal.

To Re-assemble

Fit a replacement rubber seal and a new circular joint into the recesses of the cover plate and then position the cover plate with its seal on the mainshaft. Press on the inner race of the needle roller bearing.

Fit the distance piece to the mainshaft and liberally pack the body and mainshaft with grease (not oil even if oil was removed). Fit a square type joint, over the studs of the body and feed the mainshaft into the body through the needle race already in position.

With the mainshaft entered into the ball race already in the body, support the centre of the ball race and drive or press the mainshaft fully into position at the same time entering the studs into the cover plate.

Fit a new oil seal and circular joint to the remaining cover plate and fit a square type cover joint over the studs. Fit a small rubber seal to the spacer and fit the spacer to the mainshaft. Fit the cover plate, fit tabwashers and nuts to all cover plate studs and tighten evenly.

Fit a large lockwasher to the end of the shaft then fit the nut, tighten and lock.

To Refit the Suspension Units

Bolt the unit to its bracket on the chassis frame, tighten and lock with wire Fig.133.

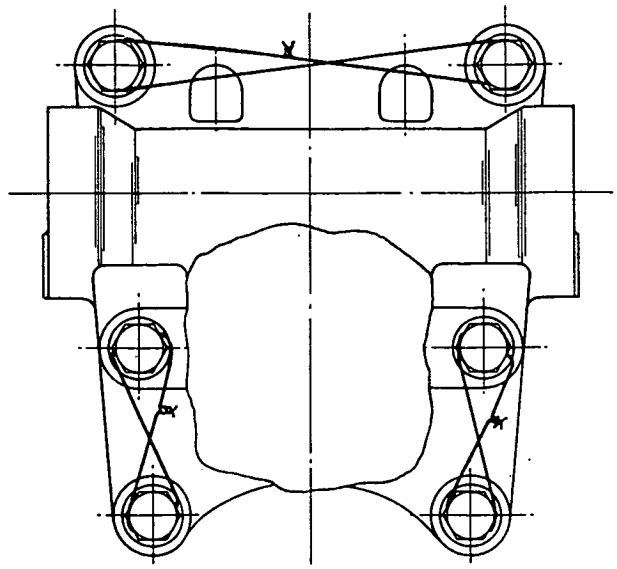


Fig. 133. Wire locking—suspension unit attachment bolts

Pass the small end of the correct handed torsion bar through the suspension unit and referring to Fig. 131 fit the stoneguard, then pass the torsion bar through to locate in its bracket on the chassis cross member.

Manoeuvre the axle until the suspension arm shaft will locate in the tapered hole of the mainshaft then fit the tabwasher and nut. Do not lock the nut if the car tracking is to be checked.

Set the torsion bars and check the tracking.

Torsion Bars

The torsion bars are located on each side of the car, at the rear, along the inside of the chassis side members. They are left-hand and right-hand and are clearly marked 'L' or 'R' on the rear ends. Under no circumstances should they be assembled incorrectly. Each bar is serrated at both ends, the front end engages the torsion bar adjuster which is secured to No.2 chassis cross member, while the rear end engages the suspension unit main shaft. Both bars have 25 serrations at the front end and 27 serrations at the rear end, thus providing accurate settings.

The rear end of each bar has a 5/16" BSF hole to provide for extraction and a half round annular groove accommodates the bolt which secures the shaft to the suspension unit mainshaft.

A flat rubber stoneguard positioned where the torsion bar passes through the chassis frame is an important point. Small stones thrown up by the car could, without this guard, wedge themsevles between the bar and the wall of the aperture and cause damage and considerable inconvenience.

Torsion Bar Adjusters

The adjuster for each bar is shown in Fig.134 and with the .300 inch dimension determined at the initial setting, adjustment can be made as required.

Removing Torsion Bars

Jack up the car and place on chassis stands well towards the rear wheels.

Disconnect the telescopic shock absorbers lower location, the rear attachment of the snubber strap and the rear coupling of the propeller shaft.

Jack up the rear axle casing until the load is relieved from the torsion bar. Remove the bolt securing the torsion bar in the suspension unit mainshaft, then withdraw the torsion bar with the extractor Fig.130.

Jack up the axle and pull the bar completely clear.

Refitting Torsion Bars

With the rear axle casing jacked up, pass the small end of the torsion bar through the suspension unit. It is now positioned for setting.

Using Fig.134 set the bars and finally insert the bolt in the suspension arm to lock the torsion bar in position.

Suspension Arms

These identical units are positioned between the mainshaft arm of the suspension units and the rear axle casing and they do not normally require attention.

They are lubricated from the supply of oil in the rear axle casing Fig.126.

The initial settings of this unit are indicated in this illustration and they form the basis of the alignment of the car tracking.

Removing the Suspension Arms

Jack up the car and support on chassis stands towards the rear wheels.

Jack up the axle and remove the rear attachment of the snubber straps.

Remove the road wheel, remove the brake drum by releasing the two countersunk screws. From behind the backplate release the tabwashers and remove the six bolts, this will release the half shaft and hub which should be withdrawn with the backplate.

With the axle jacked up to take the tension off of the torsion bars, release the tabwasher and remove the nut from the suspension arm shaft. Using extractor TFN8039 as shown in Fig.125 disconnect the taper joint.

Roll back the axle until the mainshaft arm is clear of the suspension unit. Remove the oil retainer cover.

Referring to Fig.126 it will be noted that the suspension arm is screwed into the rear axle casing. To unscrew it the cap must be removed to clear the axle casing.

Release the tabwashers and remove the four bolts and the cap together with the shims and gasket. The shims must be carefully retained as they are selective.

The unit can now be unscrewed (anti-clockwise) from the axle casing.

Dismantling

Take off the oil retainer cover and remove both spring clips from the rubber oil retainer. Break the locking wire and remove the two ball sleeve stop pins. Push out the suspension arm shaft together with the ball sleeve and the two ball sleeve housings.

Unscrew the shaft from the ball sleeve, bringing with it the rubber oil seal and its retaining ring. Remove the flanged plug at the top of the suspension arm to facilitate cleaning.

Assembly

Clean all parts and flush out the oilways. Refit the fibre washer and flanged plug to the arm.

Check that the shaft is a good fit in the phosphor bronze bush of the ball sleeve and if necessary renew the bush.

Check the ball sleeve and the two ball sleeve housings to see that they are a good spherical fit. In manufacture these parts are lapped with grinding compound to obtain a high percentage of blue marking.

With the bush and housings in good order screw the shaft into the ball sleeve until the rear faces are level. This is important for control of the tracking.

Fill the inner groove of a new oil seal with colloidal graphite and slide on to the front of the shaft. Fit the oil seal retaining ring.

With the housings in their correct positions on the ball sleeve, line up the stop pin holes and with the oil hole towards the screwed arm push the assembly into the arm. Finally align the stop pin holes, then fit the fibre washers and stop pins. Wire lock the stop pins Fig.135.

Refit the shims, gasket, cap and nuts and tighten evenly. Referring to Fig.126 check the movement of the ball joint. Some difficulty may be experienced in acquiring the correct "feel" of the ball joint since the housings are sufficiently well fitted to require a distinct jerk to free the surfaces. It should, however, be movable by a fair amount of manual force only. Adjust with shims available in .002 inch, .003 inch and .010 inch thicknesses.

Refit a rubber oil retainer with its clips and saddle pieces at the clip gaps.

The assembly is now ready to fit into the rear axle casing.

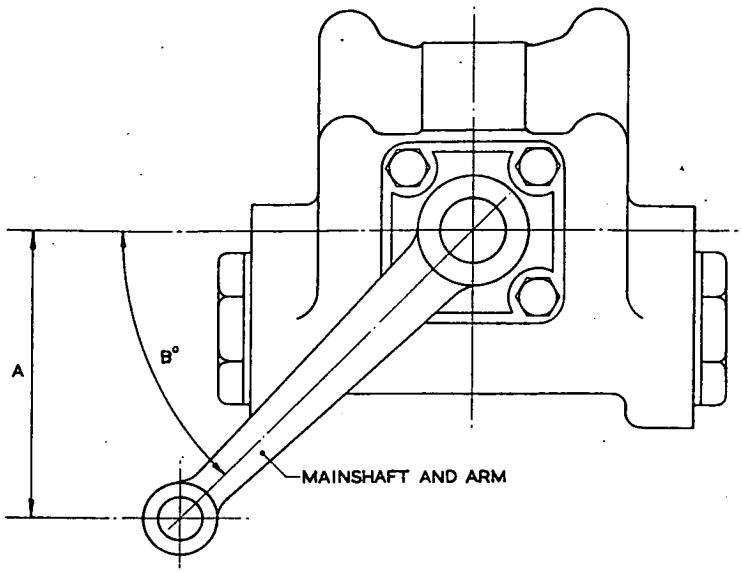


FIG. 1. NO LOAD SETTING OF MAINSHAFT AND ARM.

ASSEMBLY OF TORSION BARS.

THE TORQUE ARM SHOULD BE TOUCHING THE ADJUSTING SCREW WITH ·300" THREAD SHOWING BETWEEN THE TORQUE ARM AND THE TOP FACE OF THE SWIVEL NUT. THE MAINSHAFT AND ARM SHOULD BE ROTATED UNTIL IT MAKES AN ANGLE OF APPROXIMATELY B° BELOW THE HORIZONTAL OR A VERTICAL HEIGHT OF A". EACH END OF THE TORSION BAR CARRIES A DIFFERENT NUMBER OF SPLINES (THUS PROVIDING A VERNIER ADJUSTMENT) AND SHOULD BE ROTATED UNTIL IT FREELY ENTERS BOTH LOCATIONS AND THEN PUSHED INTO POSITION.

SEE FIGS. 1 & 3.

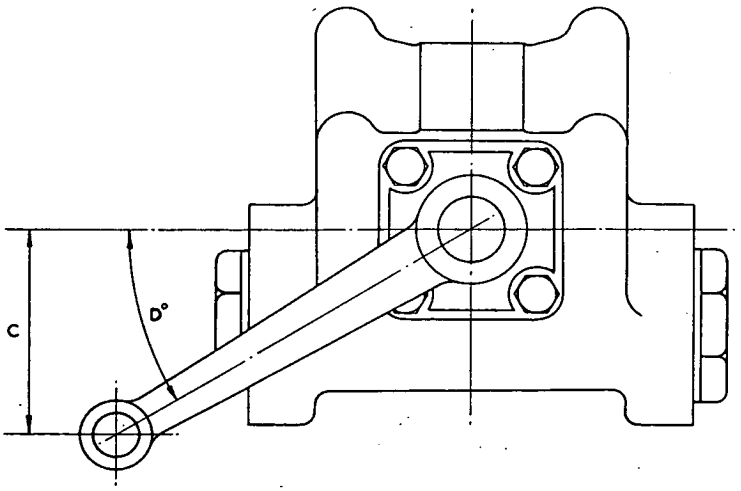


FIG. 2. KERB WEIGHT SETTING OF MAINSHAFT AND ARM.

THIS SETTING SHOULD BE CHECKED WHEN THE CAR IS IN THE KERB CONDITION I.E. CAR WITH OIL, WATER, TOOLS, SPARE WHEEL, BATTERY COMPLETE, WINDSCREEN WASHER WATER AND 1 GALLON OF PETROL.

THE ANGLE BETWEEN THE MAINSHAFT AND ARM AND THE HORIZONTAL SHOULD BE ADJUSTED BY MEANS OF THE ADJUSTING SCREW TO AN ANGLE OF D° OR A VERTICAL HEIGHT OF C".

SEE FIG. 2.

A MAXIMUM OF ·400" OF THREAD SHOULD BE SHOWING FINALLY TO ENSURE ADEQUATE FUTURE ADJUSTMENT.

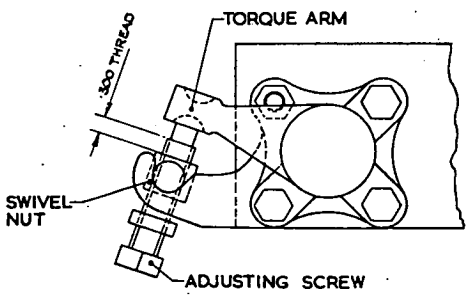


FIG. 3. INITIAL SETTING OF ADJUSTING SCREW.

	TYPE 404	TYPE 405
A"	APPROX. $6\frac{1}{8}$ INCH.	$6\frac{1}{8}$ INCH.
B°	—	50°
C"	$2\frac{3}{4}$ INCH.	$2\frac{3}{4}$ INCH.
D°	20°	20°

SKN 4379.

Fig. 134. Torsion bar setting

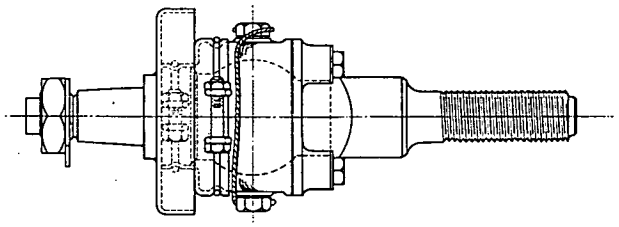


Fig. 135. Ball sleeve stop pins—wire locking

Re-assembly to the Axle Casing

Remove the four screws from the end cap and remove the cap complete with the pre-determined shims and gasket.

Screw the arm into the casing noting carefully the 1/16" dimension between the face of the bush and the lip of the arm Fig.126 when the arm is hanging downwards. If the dimension is less than 1/16" unscrew the arm one turn. This is important for control of the tracking.

Fit the cap, gasket and shims to the arm fit the tab-washers and bolts and lock.

Fit the cover for oil retainer and connect the tapered end of the shaft into the taper of the mainshaft. Fit a tabwasher and fit and tighten the nut but do not lock if alignment checks are to be taken.

Fasten the rear locations of the snubber straps and finally refit the brake backplate half-shaft, brake drum and road wheel.

Rear Ball Joint Assembly

This assembly can be seen in location in Fig.124 at the top of the differential housing and secured to the attachment unit ('A' frame). It is lubricated by the oil in the differential unit and rear axle casing.

Any slackness of the ball bolt in its housings see Fig.136 can only be corrected by removing the complete assembly.

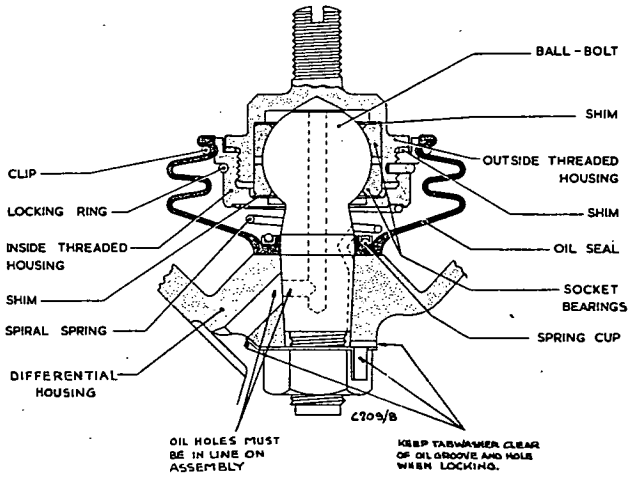


Fig. 136. Rear ball joint assembly

Removing

The rear ball joint can only be removed from inside the differential unit. It is therefore necessary to partially withdraw the half shafts, remove the differential unit and to remove the crown wheel mounting from the differential unit. When this has been done, remove the nut and its tabwasher from inside the differential housing and tap out the ball bolt from its taper location.

Dismantling

Referring to Fig. 136 remove the clip and saddle piece securing the rubber oil seal and withdraw the seal over the taper of the ball bolt followed by the spiral spring and the spring cup. Disengage and remove the locking ring.

Unscrew the housings using the vice plate TFN.8792 and the ring spanner TFN.10085 see Fig.137. Retain the shims fitted between the housings and at the top and bottom of the socket bearings.

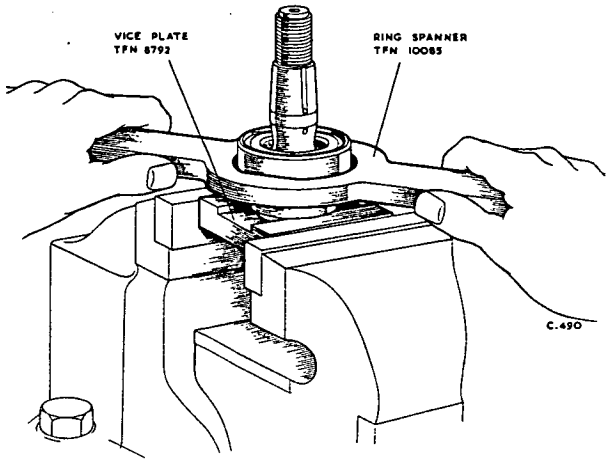


Fig. 137. Unscrewing ball joint housings

To Re-assemble

The spherical fit of the ball bolt and housings is important and either new parts or carefully prepared parts should be refitted. Any ridges should be polished away and the parts should be lapped to provide a good spherical bearing. In manufacture this has not been less than 75% blueing area.

Assemble the ball bolt and sockets into the housings with the removed shims in position and tighten securely using the ring spanner and vice plate.

The ball bolt should be capable of movement by a fair amount of manual force and careful shim adjustment is necessary to provide this.

When this is finalised drill the hole for the locking ring into the inside thread but do not drill right through. Fit the locking ring. Fit the spiral spring, the spring cup and a new rubber oil seal with its clip and saddle piece.

Refitting the Ball Joint to the Differential Housing

Ensure that the oil passage on the side of the ball bolt taper coincides with the oil passage in the differential housing. See Fig.136. Fit the angle tabwasher and nut and tighten and lock. See that the tabwasher does not obstruct the oil groove.

Telescopic Shock Absorbers

On the rear suspension of Type 404 Cars the following types of telescopic shock absorbers were fitted. On every car, however, the both shock absorbers were the same type.

Girling. Ref. DAS9. N/F Assembly. Eye fittings at both ends. Part No.9046/353.

Settings) Bump 175/15
) Rebound 225/15

Armstrong. Ref. AT.7-1186. Eye fittings at both ends.

Settings) 1150/75
) 75/900

Tefaflo. Ref. 9-T1-EE. High Duty. Eye fittings at both ends. Open length 23". Closed length 14".

Setting. AS. SP.5000.

On the rear suspension of Type 405 Cars the following telescopic shock absorbers are fitted.

Girling. DAS9/137NF. Assembly. Stem type fittings at both ends. Open length 23". Closed length 14".

Settings) Bump 175/15
) Rebound 275/15

Replacements

Should it be considered that a telescopic shock absorber requires replacement a check should first be taken to see that the taper rubbers, two at each end, are in good order and securely fitted. Replacement rubbers are available.

Serviced replacement shock absorbers are normally available from the manufacturers agents.

Removing

On Type 404 Cars it may be necessary to disconnect the fork end of the handbrake rods at the brake backplate to allow the shock absorber to be taken off of its spigot on the axle casing.

Other than this the rear shock absorbers on both the Type 404 and 405 cars can be detached at their location points without interference with other parts.

Braking System

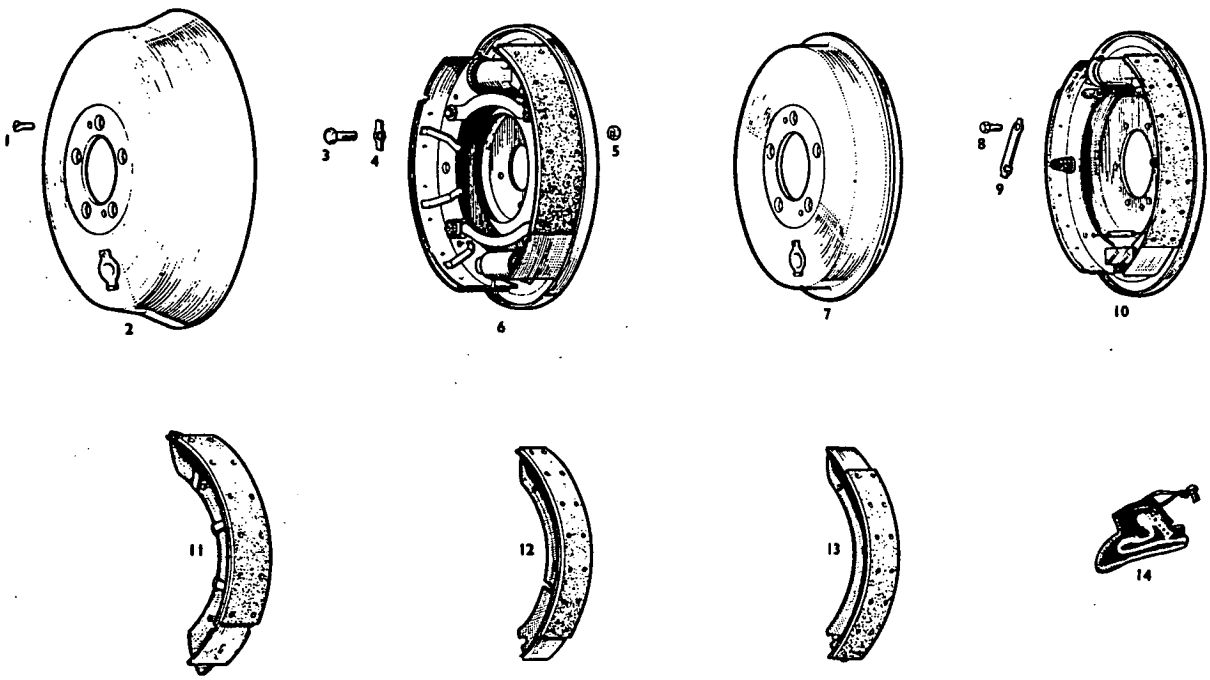
List of Contents

List of Contents

Braking System

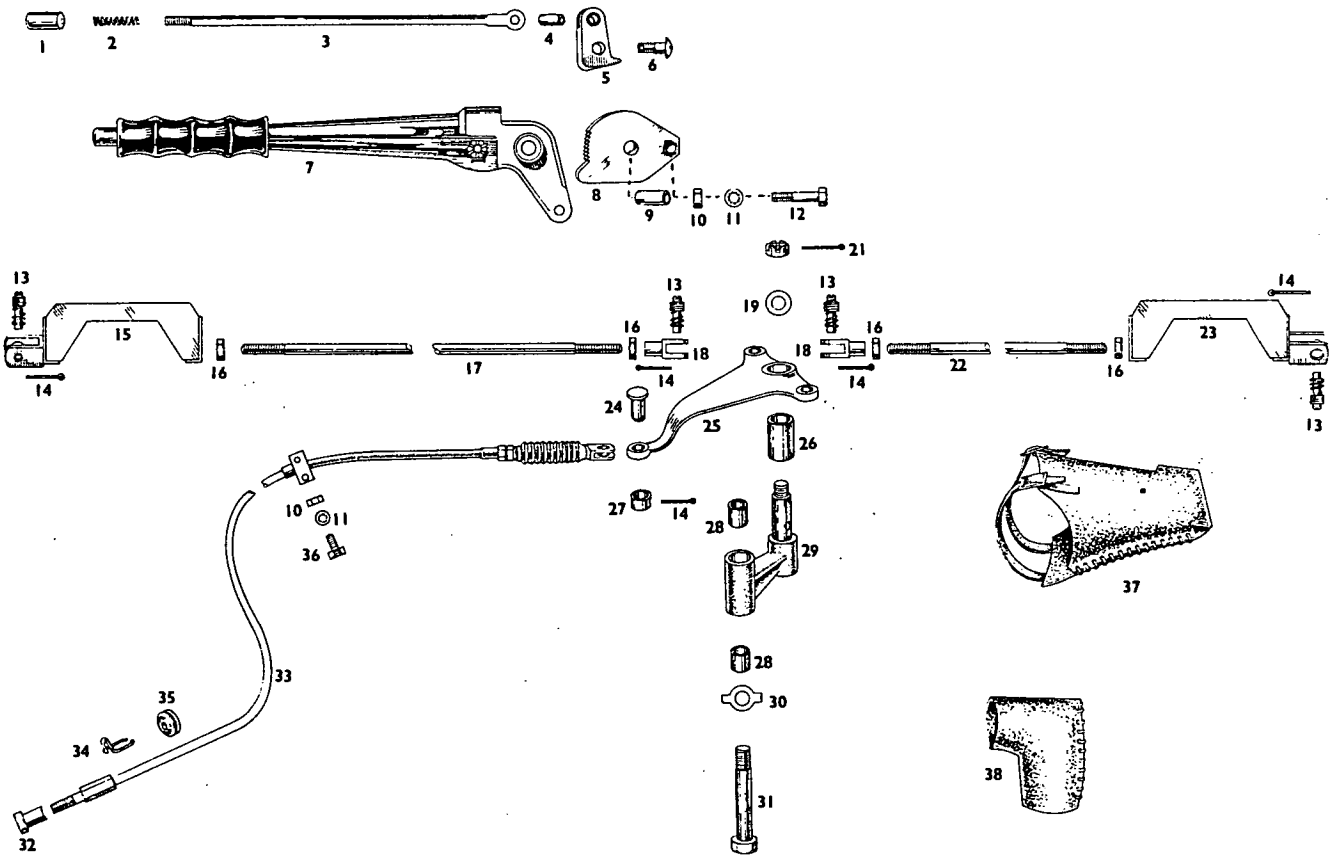
FRONT AND REAR BRAKES.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
-	1	Screw ¼" BSF Csk. Head .6 long	8	N.501451	8	Bolt	12
404-1-23060	2	Front Brake Drum - Balanced	2	N.501441	9	Tabwasher	6
FB.106/7D	3	Bolt 3/8" BSF 7/8" long	8	404-II-30034	10	Rear Brake LH Lockheed 11" x 1¾"	1
N.421291	4	Tabwasher	8	404-II-30055	-	Rear Brake RH Lockheed 11" x 1¾"	1
FN.106/K	5	Nut 3/8" BSF	8	404-II-23096	11	Front Brake Shoe	4
404-II-23094	6	Front Brake LH. Lockheed 12" x 2¼"	1	N.719076	12	Rear Brake Shoe - Leading	2
404-II-23095	-	Front Brake RH. Lockheed 12" x 2¼"	1	N.719077	13	Rear Brake Shoe - Trailing	2
N.422321	7	Rear Brake Drum - Balanced	2	N.460521	14	Gaiter - Brake Lever	2



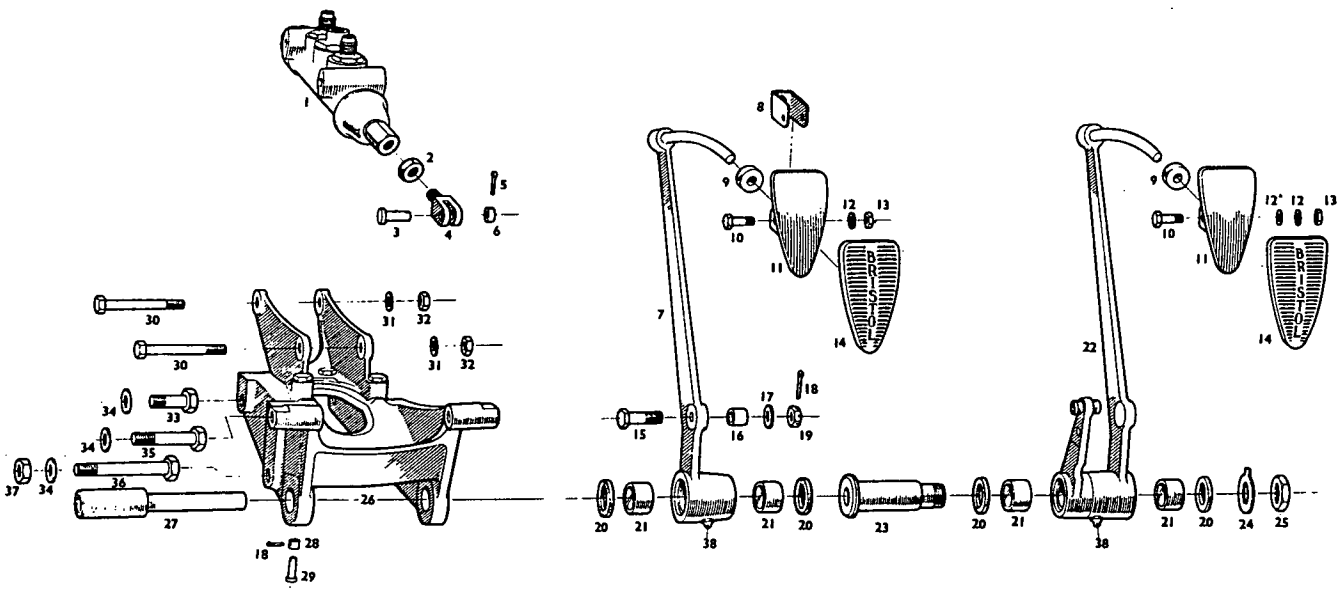
TYPE 404. HANDBRAKE AND HANDBRAKE CONTROL.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.713047	1	Pawl Rod Knob	1	FB405/K	20	Nut 5/16" BSF Slotted	1
N.713048	2	Pawl Return Spring	1	-	21	Split Pin 1/16" dia. 1" long	1
N.713049	3	Pawl End	1	404-1-24034	22	Brake Rod L.H.	1
N.713050	4	Pawl Rod Pin	1	404-1-24036	23	End Coupling L.H.	1
N.713051	5	Handbrake Pawl	1	SP4.F11	24	Shackle Pin	1
N.713052	6	Pawl Pivot Bolt	1	N.719005	25	Lever - Brake Operating	1
404-1-24076	7	Handbrake Lever Assy.	1	N.719010	26	Bush	1
N.713046/50	8	Handbrake Ratchet	1	AGS.899/6	27	Collar	1
N.713019	9	Pivot	1	N.502051	28	Bush	2
FN.104/K	10	Nut ¼ "BSF	2	N.719006	29	Compensating Lever	1
-	11	Shakeproof Washer ¼" dia.	2	AGS.195/4	30	Tabwasher	1
FB104/11D	12	Bolt ¼" BSF	2	N.502091	31	Bolt	1
N.719075	13	Pin & Spring	4	404-1-24075	32	Extension Nut	1
-	14	Split Pin 3/32" dia. ¾" long	4	404-1-24048	33	Handbrake Control	1
404-1-24049	15	End Coupling R.H.	1	404-1-24046	34	Spring Clip	1
FB205/K	16	Locknut 5/16" BSF	4	404-1-24047	35	Grommet	1
404-1-24035	17	Brake Rod R.H.	1	FS104/SD	36	Setscrew ¼" BSF	2
N.719011	18	Fork End	2	N.460451	37	Brake Lever Gaiter	1
AGS.160E	19	Washer	1	N.460661	38	Elbow Gaiter	1



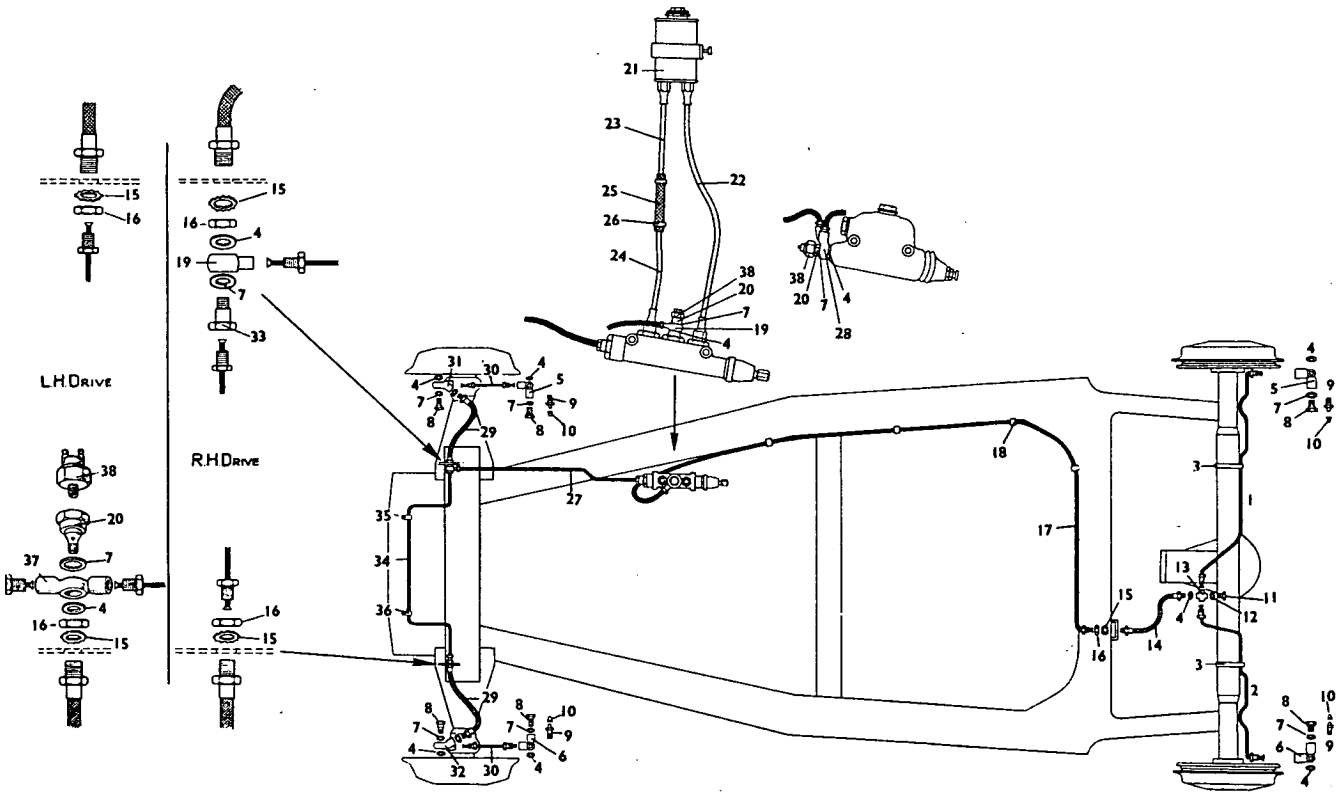
BRAKE AND CLUTCH PEDAL UNIT.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-24001	1	Tandem Master Cylinder. Lockheed Ref. 31526/3 Chassis 2001 to 2028	1	-	18	Split Pin 1/16" dia. 1" long	2
				FN.406/L	19	Nut 3/8" BSF	1
				N.471231	20	Felt Washer	4
N.470561	-	Integral Master Cylinder. Lockheed 22634 Chassis 2029 on	1	N.471250	21	Pedal Bearing	4
				404-1-24007	22	Foot Brake Lever RHD	1
UNF.206A	2	Locknut (used with 404-1-24008)	1	404-1-24070	-	Foot Brake Lever LHD	-
FN.206/K	-	Locknut (used with N.713062)	1	N.470101	23	Pedal Sleeve Bearing	1
SP.4/F12	3	Steel Pin	1	N.470111	24	Tabwasher	1
404-1-24008	4	Fork (used with Tandem Master Cylinder)	1	N.470121	25	Special Nut	1
N.713062	-	Fork (used with Integral Master Cylinder)	1	404-1-24005	26	Pedal Cradle complete Chassis 2001 to 2028	1
-	5	Split Pin 3/32" dia. x 1" long	1				
AGS.899/6	6	Collar	1	N.713058	-	Pedal Cradle. Chassis 2029 on	1
404-1-24043	7	Clutch Lever RHD	1	N.470211	27	Pedal Bearing Pin	1
404-1-24073	-	Clutch Lever LHD	-	AGS.899/2	28	Collar	1
N.713064	8	Stop Plate	1	SP.4/B9	29	Steel Pin	1
N.713061	9	Rubber Stop	2	FN.105/24D	30	Bolt (used with Tandem Master Cylinder)	2
FB.104/9D	10	Bolt	2	N.470251	-	Special Bolt (used with Integral Master Cylinder)	2
404-1-24042	11	Pedal Pad	2	-	31	Washer 5/16" Shakeproof	2
-	12	Washer ¼" Shakeproof	2	FN.105/L	32	Nut 5/16" BSF	2
-	12A	Washer ¼" Plain	1	FB-106/10D	33	Bolt	1
FN.104/L	13	Nut ¼" BSF	2	-	34	Washer 3/8" Shakeproof	3
404-1-24041	14	Rubber Pedal Pad	2	FB.106/18D	35	Bolt	1
N.470171	15	Bolt	1	FB.106/26D	36	Bolt	1
N.470181	16	Distance Piece	1	FN.106/K	37	Nut 3/8" BSF	1
-	17	Washer 3/8" Plain	1	N.471240	38	Grease Nipple	2



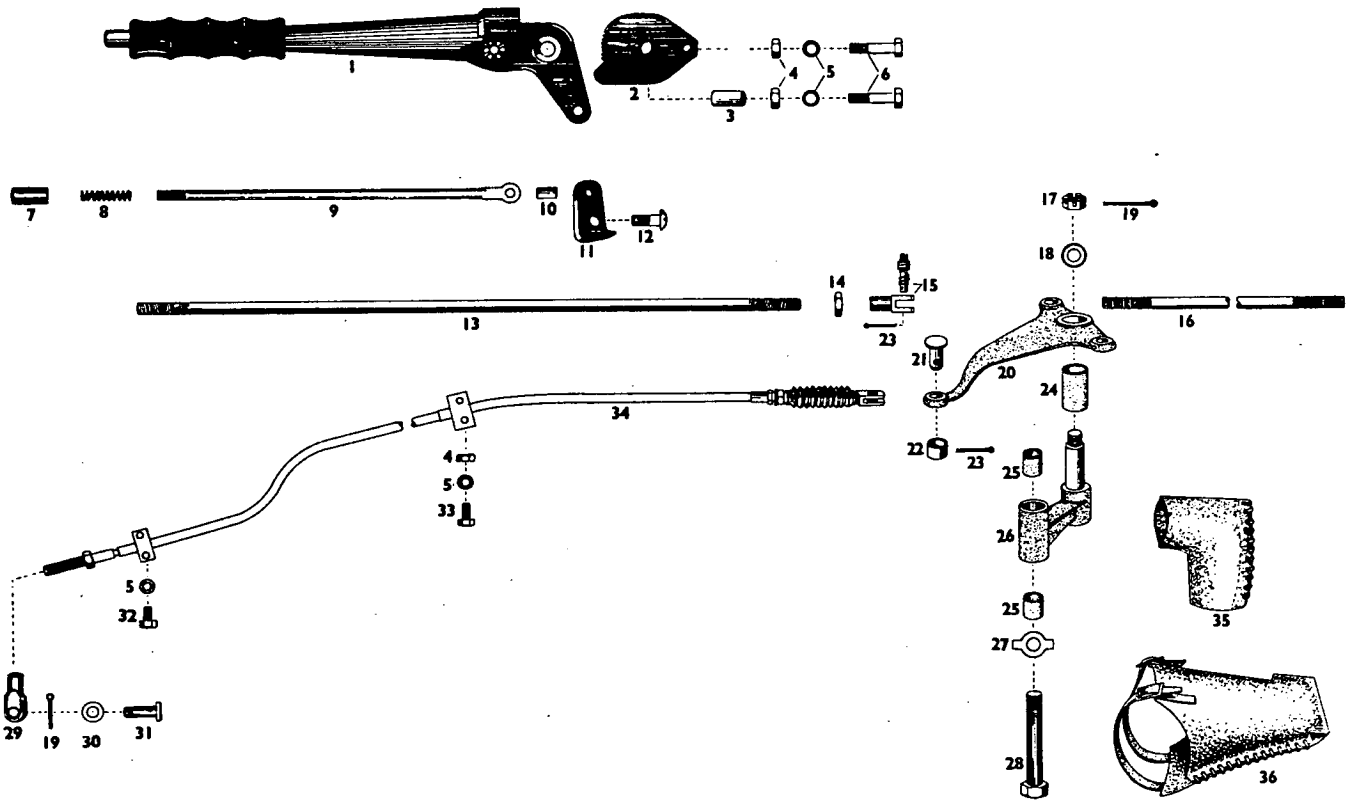
TYPE 404. HYDRAULIC BRAKE SYSTEM.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-24029	1	Rear Brake Pipe - RH	1	404-1-24014	21	Supply Tank - Lockheed 7218/3)	1
404-1-24030	2	Rear Brake Pipe - LH	1	404-1-24017	22	Supply Pipe)	1
N.470761	3	Clip	2	404-1-24015	23	Supply Pipe - Short - Upper) Used	1
N.470771	4	Gasket - Lockheed KL.45518	8	404-1-24016	24	Supply Pipe - Short - Lower) up to	1
404-1-23064	5	Banjo Connection - Lockheed 22864	2	404-1-24020	25	Hose - Lockheed 16742) Chassis	1
404-1-23065	6	Banjo Connection - Lockheed 22863	2	404-1-24021	26	Hose Clip - Lockheed K.20202) 2028	2
N.470781	7	Gasket - Lockheed KL.44522	7	404-1-24018	27	Front Brake Pipe RHD)	1
N.470791	8	Banjo Bolt - Lockheed 10543	4	404-1-24071	-	Front Brake Pipe LHD)	1
N.470831	9	Bleeder Screw - Lockheed 12272	4				
N.471091	10	Cover for Bleeder Screw - Lockheed 11655	4	405-1-24016	-	Front Brake Pipe RHD) Used on	1
FS.106/4D	11	Setscrew 3/8" BSF ½" long	1	405-1-24018	-	Front Brake Pipe LHD) and from	1
-	12	Washer 3/8" Shakeproof	1	404-1-23068	28	Banjo - Two Way - Lockheed) Chassis	1
N.470741	13	3 Way Union - Lockheed 7965/4	1			23775) 2029	
N.470891	14	Brake Hose - Rear	1				
N.470821	15	Washer - Shakeproof Lockheed K.19411	3	N.470901	29	Brake Hose - Front	2
N.470811	16	Locknut - Lockheed 23897	3	404-1-23063	30	Bridge Pipe	2
404-1-24019	17	Rear Brake Pipe - RHD) Used up to	1	404-1-23068	31	Banjo Connection - Lockheed 23775	1
404-1-24072	-	Rear Brake Pipe - LHD) Chassis 2028		404-1-23069	32	Banjo Connection - Lockheed 23776	1
				N.470801	33	Banjo Bolt - Lockheed 7964	1
404-II-24078	-	Rear Brake Pipe RHD) Used on and from	1	404-1-24009	34	Front Cross Pipe RHD	1
404-II-24080	-	Rear Brake Pipe LHD) Chassis 2029		404-1-24081	-	Front Cross Pipe LHD	1
				404-1-24024	35	Clip RH	1
N.620571	18	Spring Clip - Trimount 99304	5	404-1-24025	36	Clip LH	1
N.470711	19	Banjo Connection - Lockheed 7960	1	N.470701	37	Banjo Union Lockheed 8035	1
404-1-24023	20	Banjo Bolt - Lockheed 8048	1	404-1-24022	38	Stop Light Switch - Lucas HL2	1



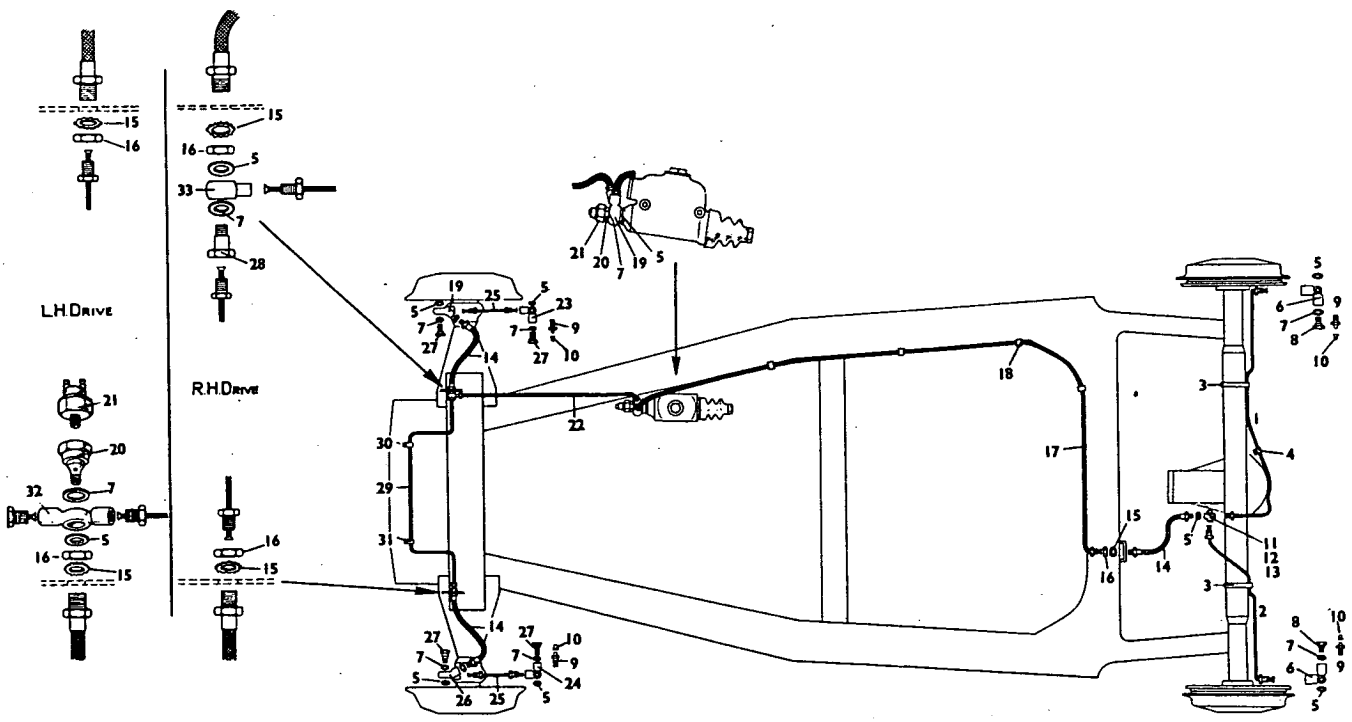
TYPE 405. HANDBRAKE AND HANDBRAKE CONTROL.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
405-1-24026	1	Handbrake Lever	1	-	19	Split Pin 1/16" dia. x 1" long	2
N.713046/50	2	Handbrake Ratchet	1	N.719005	20	Lever - Brake Operating	1
N.713019	3	Pivot	1	SP.4/F11	21	Shackle Pin	1
FN.104/K	4	Nut ¼" BSF	4	AGS.899/6	22	Collar	1
-	5	Washer ¼" Shakeproof	6	-	23	Split Pin 3/32" dia. x ¾" long	5
FB.104/15D	6	Bolt ¼" BSF	2	N.719010	24	Bush	1
N.713047	7	Pawl Rod Knob	1	N.502051	25	Bush	2
N.713048	8	Pawl Return Spring	1	N.719006	26	Compensating Lever	1
N.713049	9	Pawl Rod	1	AGS.195/4	27	Tabwasher	1
N.713050	10	Pawl Rod Pin	1	N.502091	28	Bolt	1
N.713051	11	Pawl	1	N.713069	29	Fork End	1
N.713052	12	Pawl Pivot Bolt	1	-	30	Washer ¼" Plain	1
N.719009	13	Brake Rod R.H.	1	N.713020	31	Handbrake Lever Pin	1
FN.205/K	14	Locknut 5/16" BSF	4	FS.104/4D	32	Setscrew ¼" BSF	2
N.719011	15	Fork End	4	FS.104/5D	33	Setscrew ¼" BSF	2
N.719008	16	Brake Rod L.H.	1	N.713079	34	Handbrake Control	1
FN.405/K	17	Nut 5/16" BSF Slotted	1	N.460661	35	Elbow Gaiter	1
AGS.160/E	18	Washer 5/16" dia.	1	N.460451	36	Brake Lever Gaiter	1



TYPE 405. HYDRAULIC BRAKE SYSTEM.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
405-1-30002-2	1	Rear Brake Pipe RH	1	405-1-24019	-	Rear Brake Pipe - LH Drive	1
405-1-30002-1	2	Rear Brake Pipe LH	1	N.620571	18	Spring Clip - Trimount 99304	1
N.470761	3	Clip	2	404-1-23068	19	Banjo Connection - Lockheed 23775 - RH Drive	1
-	-	Screw 2BA Cheese Head 5/8" long	2				
-	-	Washer 2BA Shakeproof	2	404-1-23069	-	Banjo Connection - Lockheed 23776 - LH Drive	1
-	-	Nut 2BA Plain	2				
405-1-30022	4	Clip	1	404-1-24023	20	Banjo Bolt - Lockheed 8048 - RH Drive	2
-	-	Bolt 2BA Hex. Hd 7/16" long	1	404-1-24012	-	Banjo Bolt - Lockheed 10543/4 LH Drive	1
-	-	Washer 2BA Shakeproof	1	404-1-24022	21	Stop Light Switch - Lucas H.L.2	1
-	-	Nut 2BA Plain	1	405-1-24016	22	Front Brake Pipe - RH Drive	1
N.470771	5	Gasket - Lockheed KL.44518	9	405-1-24018	-	Front Brake Pipe - LH Drive	1
N.470751	6	Banjo Connection - Lockheed 8047	2	404-1-23064	23	Banjo Connection - Lockheed 22864	1
N.470781	7	Gasket - Lockheed KL.44522	8	404-1-23065	24	Banjo Connection - Lockheed 22863	1
N.471271	8	Banjo Bolt - Lockheed 27175	2	404-1-23063	25	Bridge Pipe	2
N.470831	9	Bleeder Screw - Lockheed 12272	4	404-1-23069	26	Banjo Connection - Lockheed 23776	1
N.471091	10	Cover for Bleeder Screw - Lockheed 11655	4	N.470791	27	Banjo Bolt - Lockheed 10543	4
N.470741	11	3 way Union - Lockheed 7965/4	1	N.470801	28	Banjo Bolt - Lockheed 7964	1
FB.104/12D	12	Bolt ¼" BSF Hex Hd 1½" long	1	404-1-24009	29	Front Cross Pipe RH Drive	1
-	13	Washer ¼" Shakeproof	1	404-1-24081	-	Front Cross Pipe LH Drive	1
N.470901	14	Flexible Brake Pipe - Lockheed KL.48924	3	404-1-24024	30	Clip RH	1
N.470821	15	Washer Shakeproof Lockheed K.19411	3	404-1-24025	31	Clip LH	1
N.470811	16	Locknut - Lockheed 23897	3	N.470701	32	Banjo Union Lockheed 8035	1
405-1-24012	17	Rear Brake Pipe - RH Drive	1	N.470711	33	Banjo Connection Lockheed 7960	1



Braking System

Description

The 'Lockheed' hydraulic foot brake system operates on all four wheels via an integral master cylinder mounted in the foot pedal cradle.

On Type 404 Cars up to Chass 2028 a tandem master cylinder is fitted Fig.138 the front cylinder actuating the rear wheel brakes and the rear cylinder actuating the front brakes. A separate reservoir mounted on the bulkhead is linked to the master cylinder by two feed pipes.

On and from Chassis 2029 and all Type 405 Cars have a single type master cylinder with its own internal reservoir. Fig.139 and Fig.140.

A pressure operated electrical switch fitted to the integral cylinder brings the stop lamp into operation.

Adjustments and Maintenance

Front Brakes Fig.141

Adjustment to the front brakes is entirely automatic by means of an adjusting mechanism which operates on application of the brakes.

Fitting Replacement Brake Shoes

No special tools are needed.

Jack up the car, remove the road wheel, then remove the brake drum.

Remove the soft circlip and washer from each brake shoe pivot post. Extract the split pin, remove the nut and the adjuster parts and adjuster bar finally removing the spring and bolt.

On later Type 405 Cars only a brake shoe steady spring is fitted and this must be compressed and unhooked from its bracket on the backplate.

Move the brake shoes to relieve the tension springs, detach the springs and lift away the shoes.

To refit brake shoes, position them and fit the tension springs, where applicable fit the steady springs. Fit the adjuster bars and keep the brake shoes in the fully closed position.

Fit the brake drums and with the normal application of the brake pedal the shoes should automatically adjust themselves. Check this and see that the drum is comparatively free when the brake is released.

Fit the road wheel. Bed the brakes in carefully when driving without early resorting to hard braking at high speed, causing heat spotting.

Rear Brakes Fig.142

Adjustment for Normal Wear

The following is the correct method of adjustment to compensate for wear of the rear brake linings. When they are adjusted by this method excessive travel of the handbrake lever due to brake lining wear is corrected.

Wedge the front wheels, release the handbrake, jack up the rear of the car and remove the road wheels.

Swing the dust cap on the brake drum to expose the adjuster hole then turn the brake drum until it is opposite the slotted head of the micram adjuster.

Using a screwdriver Fig.143 turn the adjuster clockwise until the shoes bear against the drum, then turn the adjuster back to the nearest notch. Revolve the drum then apply the footbrake hard, this will ascertain that the shoes are positioned correctly. Check the free rotation of the drum again, close the dust cap and fit the road wheel.

Adjust both brakes as near as possible equally.

Fitting Replacement Brake Shoes

With the front wheels wedged, jack up the rear of the car, remove the road wheel and then the brake drums.

Remove the steady spring from the trailing shoe then tilt the shoe free of its locations. Remove the steady spring from the leading shoe and withdraw the shoes. Detach the pull-off and tension springs, and remove the micram adjuster and mask from the end of the leading shoe.

To refit the shoes, position the micram adjuster and mask on the leading brake shoe. Note the trailing shoe is identified by a small pad welded near the slot at the end of the shoe. Position the shoe in the backplate pad and locate the mask and adjuster on the wheel cylinder. Fig.144.

Fit the trailing shoe to the backplate pad and to the rear of the brake cylinder. Fit the pull-off and tension springs and fit the steady springs.

Check that the handbrake is off and that the handbrake lever protruding through the backplate is fully released. With the micram adjuster in its minimum setting, fit the brake drums.

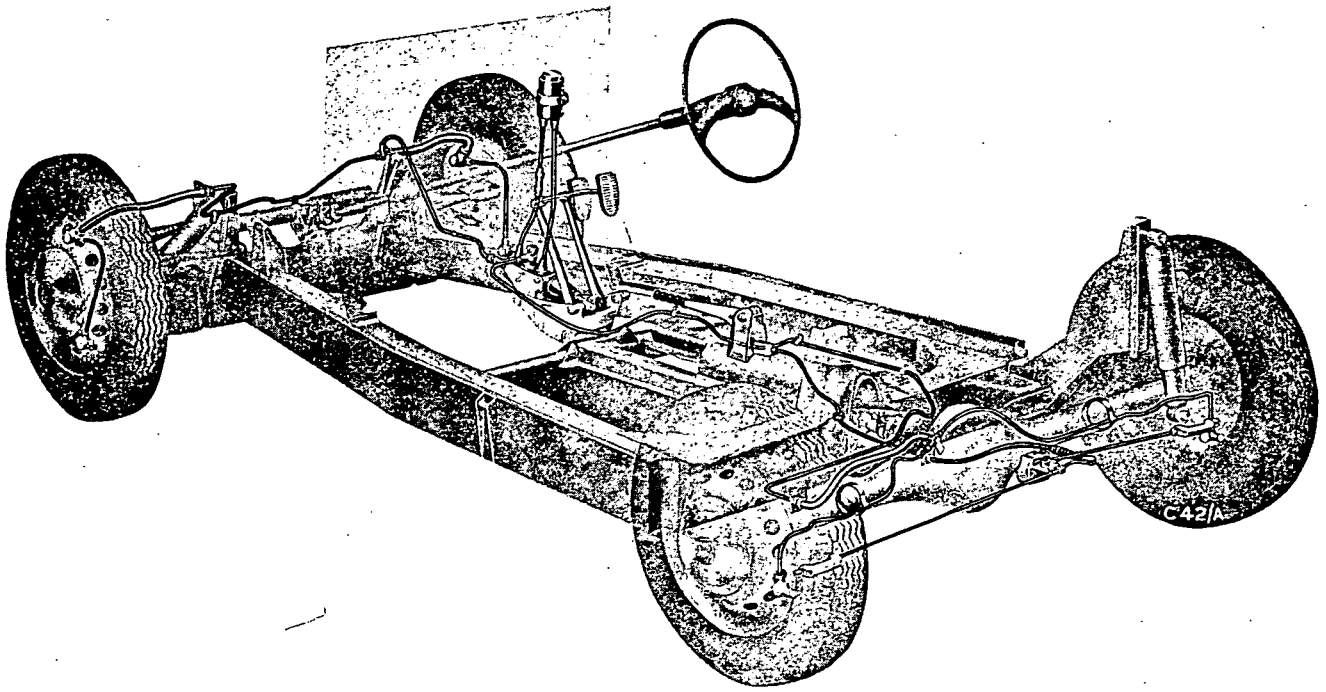


Fig. 138. Braking system (Type 404 car) tandem master cylinder

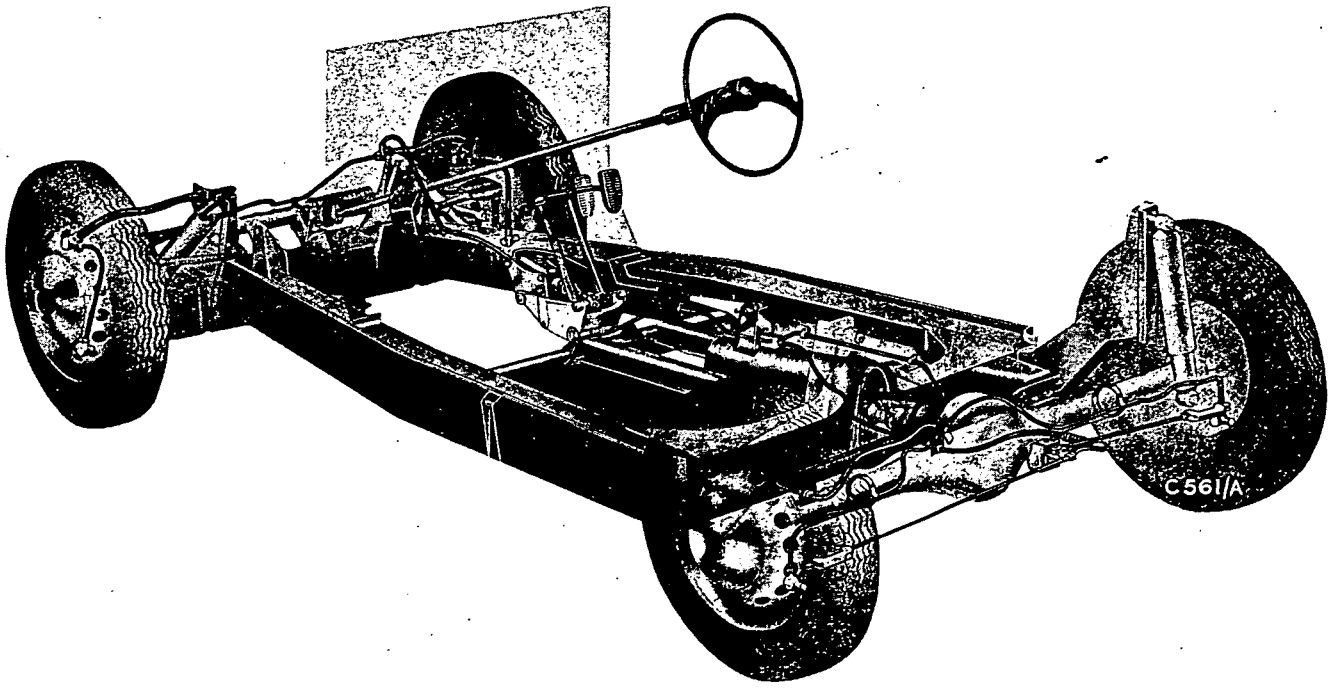


Fig. 139. Braking system (Type 404 car) integral master cylinder

Check the free rotation of the drum, push back the dust cover and using a screwdriver Fig.143 turn the adjuster clockwise until the shoes bear against the drum, then turn the adjuster back to the nearest notch. Revolve the drum then apply the footbrake hard to ensure that the shoes are positioned correctly.

Check the free rotation of the drum again, close the dust cap and fit the road wheel.

As with the front brakes, bed the shoes in by careful application of the brakes in the early stage.

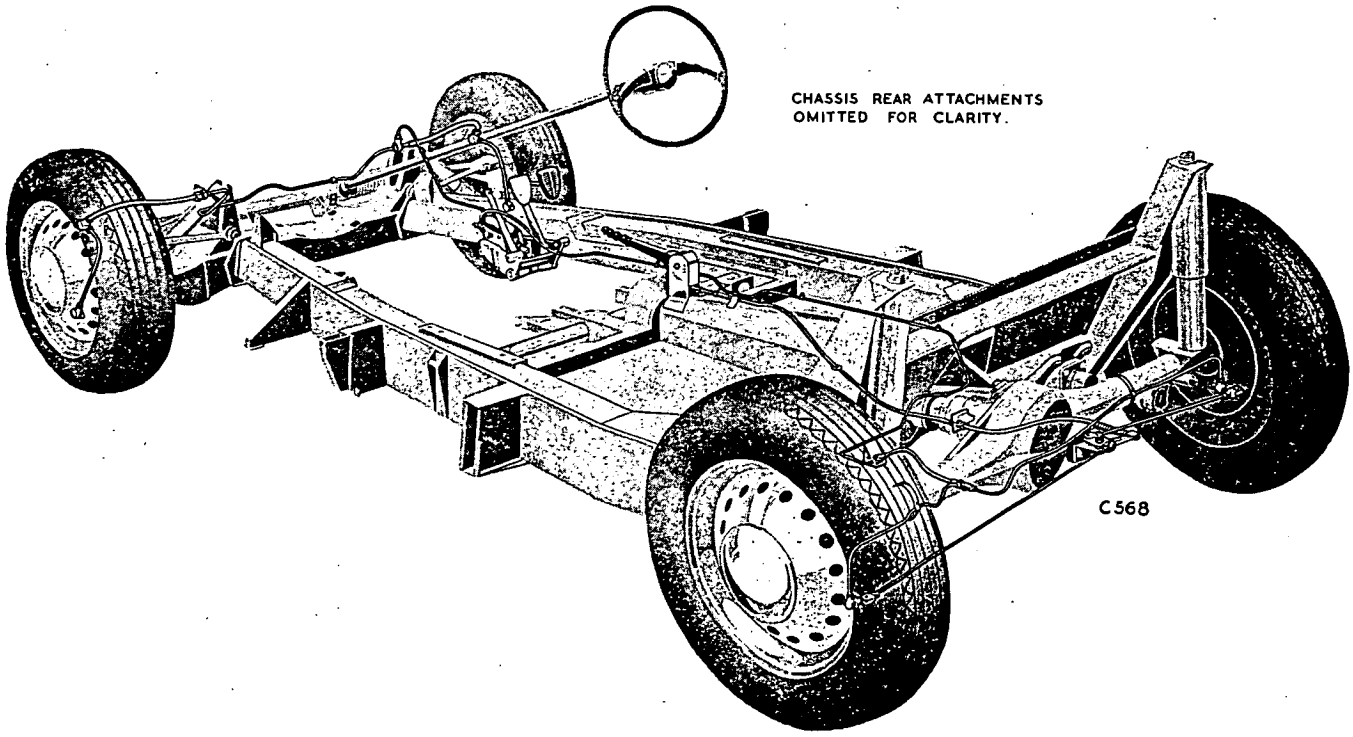


Fig. 140. Braking system (Type 405 car)

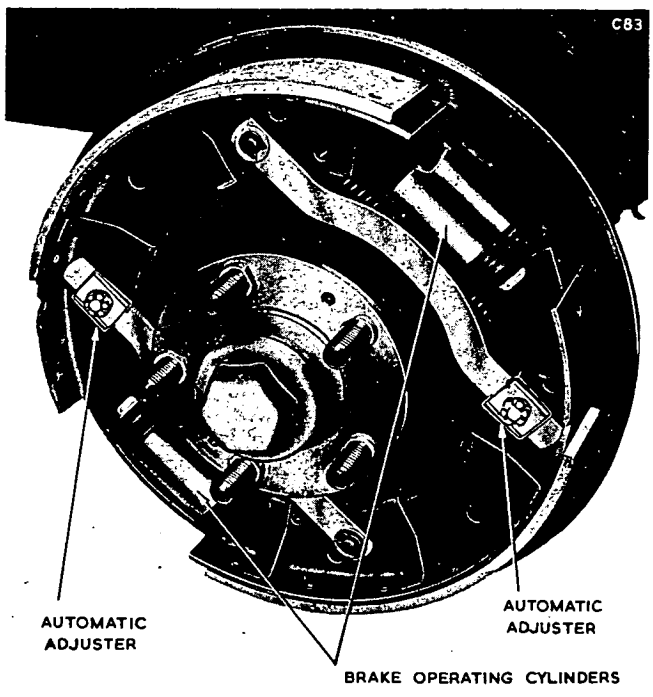


Fig. 141. Front brake

Handbrake

The handbrake is a normal ratchet controlled lever, situated between the front seats, and operates the rear brakes through an encased cable control assembly. The cable is connected to a brake operating lever mounted on a pivoted compensating lever Fig.145 on the rear axle casing; brake rods link the operating lever with the levers in the rear brake cylinders.

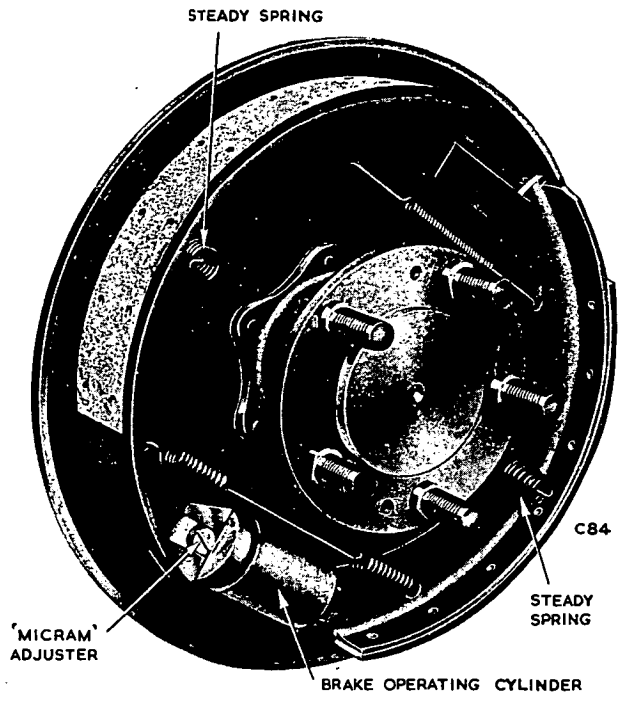


Fig. 142. Rear brake

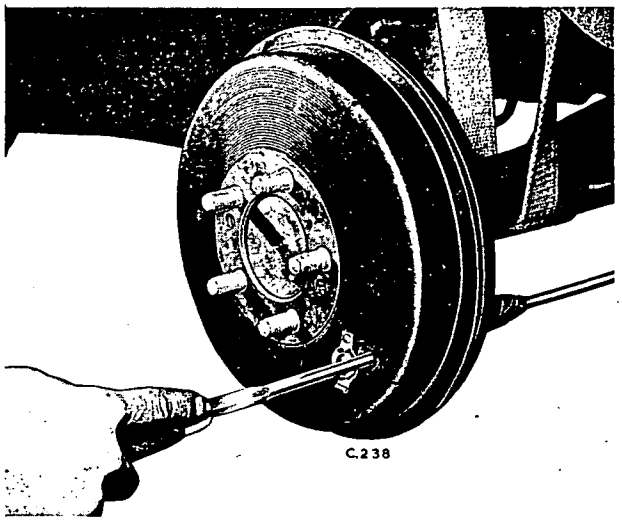
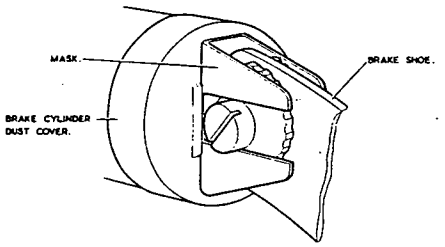


Fig. 143. Adjusting rear brakes



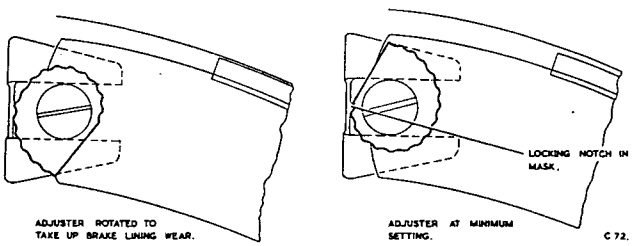


Fig. 144. 'Micram' adjuster

The correct handbrake travel is 3 to 4 notches on the ratchet. On no account attempt to correct for wear by adjusting the cable or the rods since these are set by the manufacturers. When the rear brakes are set correctly the handbrake should have its correct travel.

Replacements

In the event of a cable breaking it is necessary to replace the complete handbrake control assembly as the cable is swaged into the ends and load tested.

To Remove the Handbrake Control

Type 404 Cars

Remove the seats, carpets and floor coverings.

Referring to Fig.146 remove the adjusting nut and the spring clip, take the cable clear of these attachments. Remove the grommet from the right hand rear floor. From beneath detach the two screws securing the control to the chassis, release the locknut Fig.145 on the rear axle casing, remove the gaiters and take out the pin attaching the fork end to the brake compensating lever.

To Fit a Handbrake Control

Feed the rigid end through the floor aperture and connect the chassis attachments, connect to the axle casing and tighten securely. Fit the spigot grommet. Leave the front and rear ends for final setting.

To Remove the Handbrake Control

Type 405 Cars.

Remove the seats, carpets and floor coverings.

Referring to Fig. 146 extract the split pin and remove the pin from the handbrake fork end. Release the locknut and unscrew the fork end.

Remove the screws securing the clip to the chassis on the tunnelling and remove the sealing plate from the rear floor. From beneath detach the two screws securing the control to the chassis, release the locknut Fig.145 on the rear axle casing and extract the pin attaching the fork end to the brake operating lever.

To Fit a Handbrake Control

Feed the rigid end through the floor aperture and connect the chassis attachments. Fit the sealing plate to the rear floor. Connect to the axle casing and tighten securely. Leave the front and rear fork ends free for final setting.

Setting the Handbrake and Controls

This setting is only applicable if a component of the braking system has been disturbed for the replacement of a part, for example. It should not be used to compensate for normal wear.

Wedge the front wheels, jack up the rear of the car and support on chassis stands. Remove the rear wheels. Assuming that the seats, floor coverings and carpets have already been removed. Remove the gaiters and detach the brake rod fork ends from the brake cylinder levers at the brake backplates.

Connect the handbrake control at the front and rear ends at the same time adjusting the cable to give the .100 inch dimension as shown in Fig.146. Check that the handbrake lever will move through 8 notches (full ratchet range).

Adjust the brake shoes by means of micram adjusters (1 click off from binding position).

With the handbrake lever in the off position adjust the brake rods so that the fork ends can be assembled to the rear cylinder levers with the brake compensating lever positioned dead fore and aft. Take up any slackness in the brake cylinder lever then re-pin the fork ends and

lubricate. Check that the drum is free to rotate. Fit the gaiters.

Refit the wheels. With the car standing on the ground this adjustment should enable the handbrake to be applied

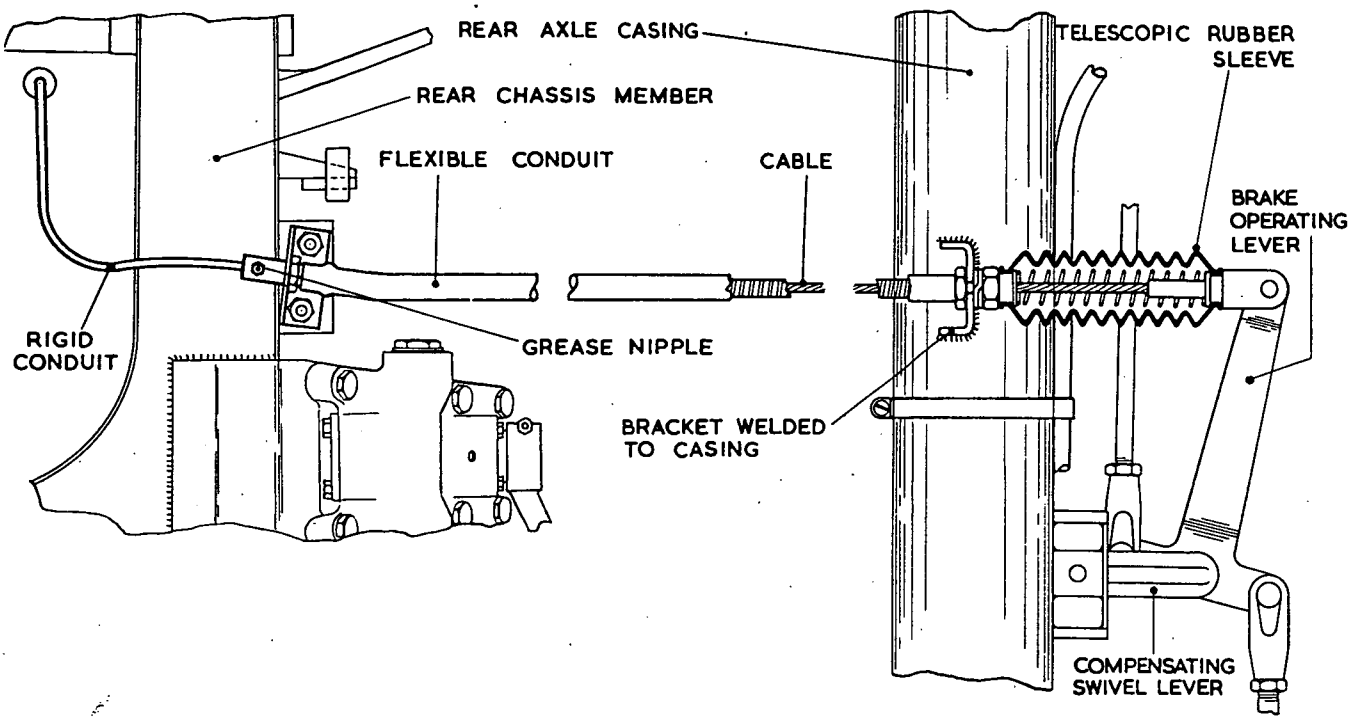


Fig. 145. Handbrake arrangement at rear axle

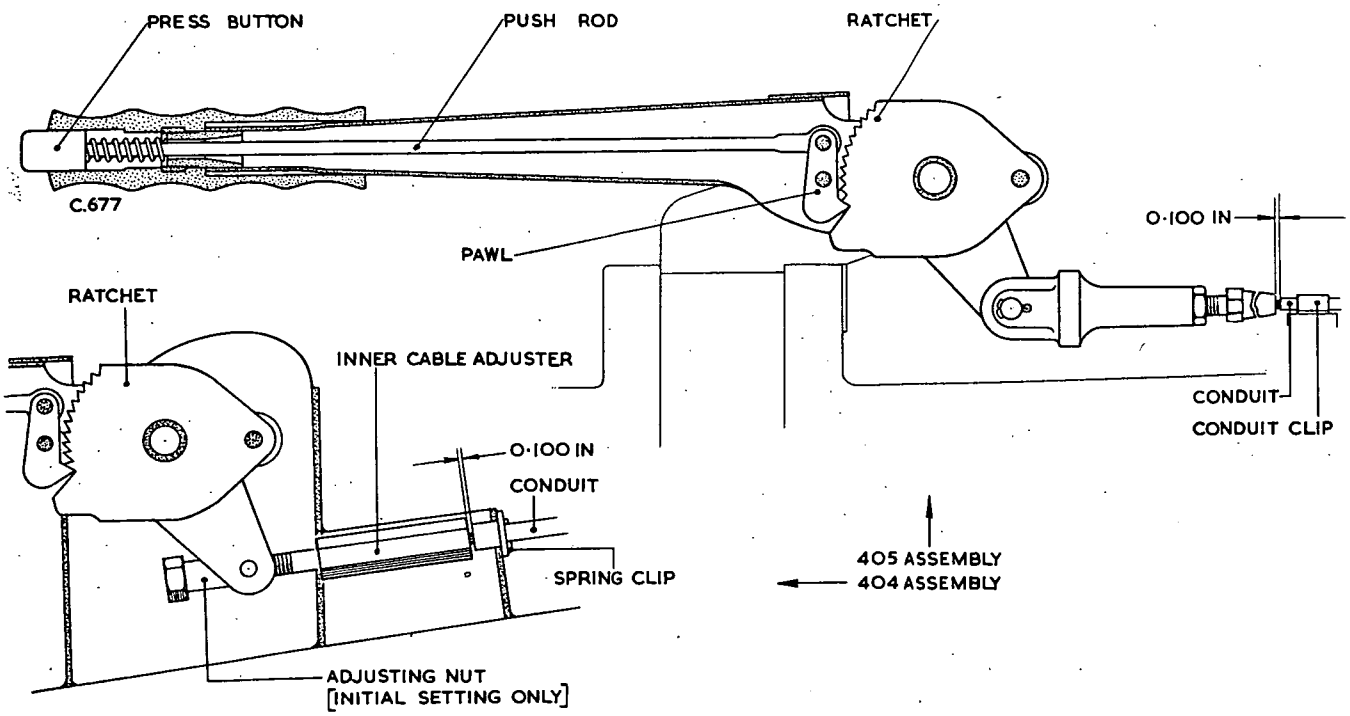


Fig. 146. Handbrake

3 to 4 teeth on the ratchet from the 'off' to the 'on' position.

Brake Pedal Adjustment

The end float between the push rod and piston of the integral master cylinder is correct when the brake pedal pad can be depressed 1/2 inch before the piston commences to move. This is best checked by hand.

If adjustment is necessary, release the locknut Fig.147 and rotate the push rod on the thread of the fork end. Lock securely when correct adjustment has been made.

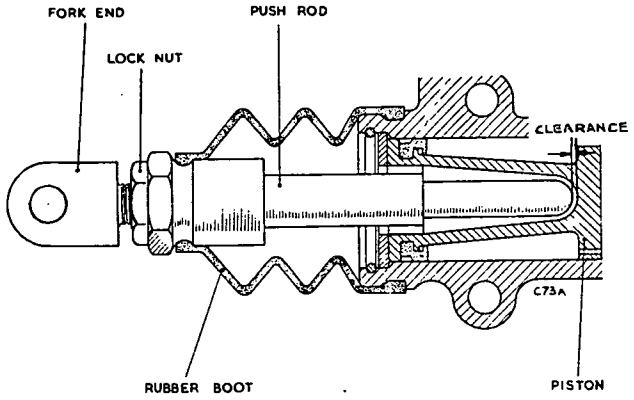


Fig. 147. Brake pedal adjustment

It is essential to have clearance between the push rod and piston or the by-pass port may be obstructed causing the brake to drag.

Bleeding the System

'Bleeding' the system is not a routine maintenance operation and it should only be necessary when the hydraulic system has been disturbed.

On Type 404 Cars up to Chassis 2028 where the tandem master cylinder is used, the feed to the primary cylinder is direct from the reservoir while a second tank within the reservoir feeds the secondary cylinder. Maintaining the fluid level while bleeding the brakes is essential and on this system it is recommended that the brakes are bled in pairs ie, both front brakes and then both rear brakes.

On Type 404 Car Chassis 2029 onwards and on all Type 405 Cars fill the reservoir of the master cylinder to 1/2 inch below the filler cap and keep it at least 1/4 full throughout the operation otherwise air will be drawn into the system necessitating a fresh start.

On both systems proceed as follows:

A bleeder screw is located on each brake backplate and is protected by a rubber cap. Clean off all surrounding dirt, remove the cap and attach the rubber tube, supplied with the car tool kit. Submerge the other end of the rubber tube in a glass jar containing brake fluid. Fig.148.

Using the bleeder wrench, supplied with the car tool kit, open the bleeder screw one complete turn.

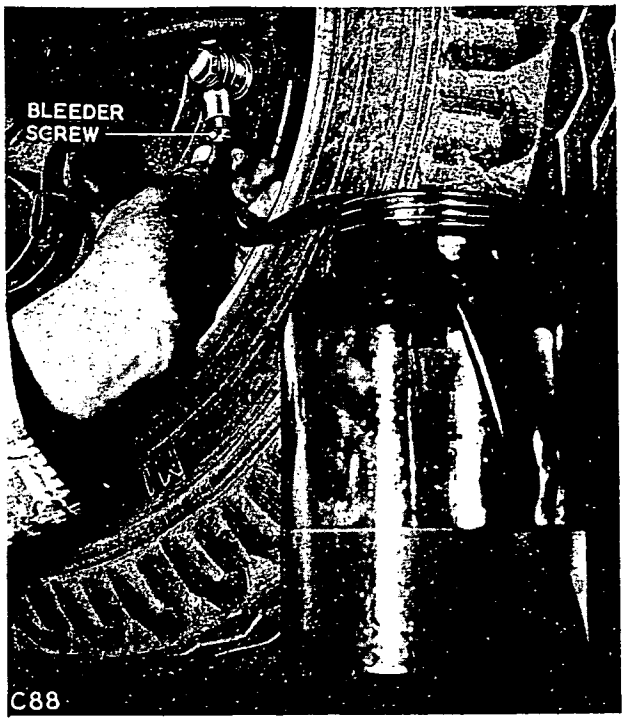


Fig. 148. Bleeding the brakes

Have the brake pedal depressed slowly and allow it to return unassisted, and repeat the pumping action with a slight pause between each action. Watch the flow of fluid into the jar, when air bubbles cease to appear tighten the bleeder screw securely as the brake pedal is being depressed, then remove the tube and refit the cap.

Repeat the process on the other wheels.

Removing and Fitting Flexible Brake Pipes

Fig.149 shows the connections from the rigid pipes to the flexible pipes.

To avoid damage on joints (A) unscrew the union nut and release the rigid pipe. Holding the hexagon of the flexible pipe to prevent it from turning unscrew and remove the locknut and special washer. The flexible pipe is now free to rotate and can be unscrewed by its own hexagon at the other end. At joint (B) unscrew the union and release the rigid pipe. Unscrew the banjo bolt. Then as (A). At joint (C), unscrew the stop light switch and the banjo bolt. Then as (A).

To refit the pipes, reverse the removing procedure and finally bleed the system.

Tandem Master Cylinder Lockheed Part No. 31873

Removing

Disconnect the battery and referring to Fig.150 disconnect the leads from the stop light switch.

Detach the two pipe connections making provision to

catch the fluid in a clean container (see 10A). Unscrew the stop light switch and remove the banjo bolt to release the upper pipe line. Unscrew the union and release the front pipe line.

Locate a suitable rod in the push rod seating in the end of the primary piston and carefully push the remaining parts clear of the cylinder.

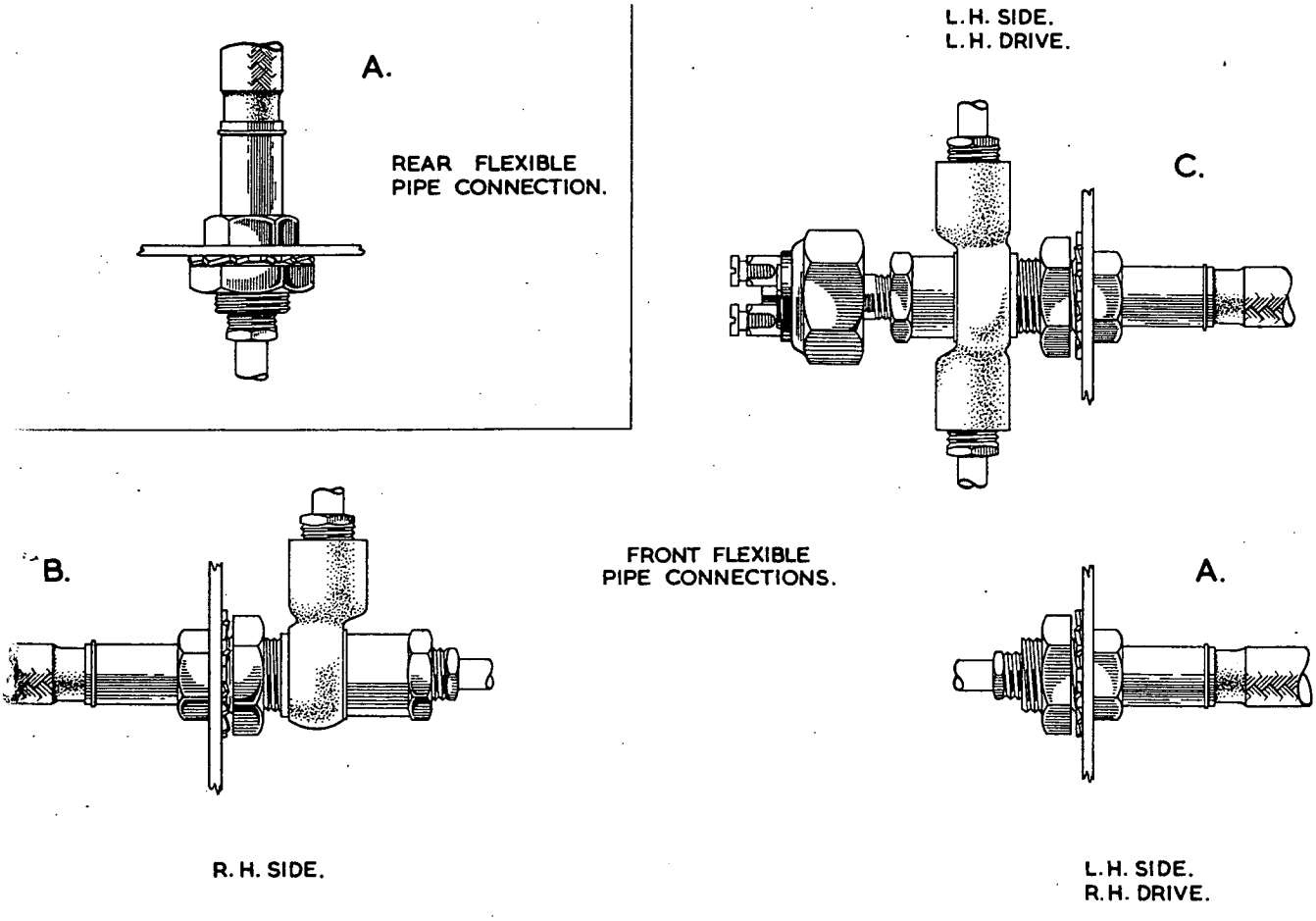


Fig. 149. Flexible pipe fittings

Remove the nuts, shakeproof washers and bolts securing the cylinder to the pedal cradle, then ease the rubber boot from the cylinder barrel and withdraw the assembly leaving the rubber boot and push rod in position.

Dismantling Fig.151.

Unscrew the inlet adaptors from the top of the cylinder, followed by the outlet adaptor from the centre with its valve parts.

At the push rod end, push the piston down the barrel slightly and extract the circlip and stop washer. Unscrew the outlet adaptor at the other end and withdraw the parts back to the secondary piston.

Remove the stop pin and washer from the underside of the barrel.

Re-assembling

Replacement rubber parts are:-

Valve Cup	Lockheed 608(2 reqd)
Valve Washer	Lockheed 5966(2 reqd)
Seal for Piston	Lockheed 30832(3 reqd)
Seal for Inlet Adaptor	Lockheed 31592(2 reqd)
Seal for Outlet Adaptor	Lockheed 31593(1 reqd)
Boot	Lockheed 24995(1 reqd)

Wash all parts thoroughly. If rubber parts are being used again clean with brake fluid.

Dip the parts in brake fluid and assemble wet.

Stretch the rubber seals into their respective recesses in the secondary piston with the smaller diameters back to back against the dividing collar, and insert this assembly, seals last, into the plain end of the cylinder pushing it about central into the bore.

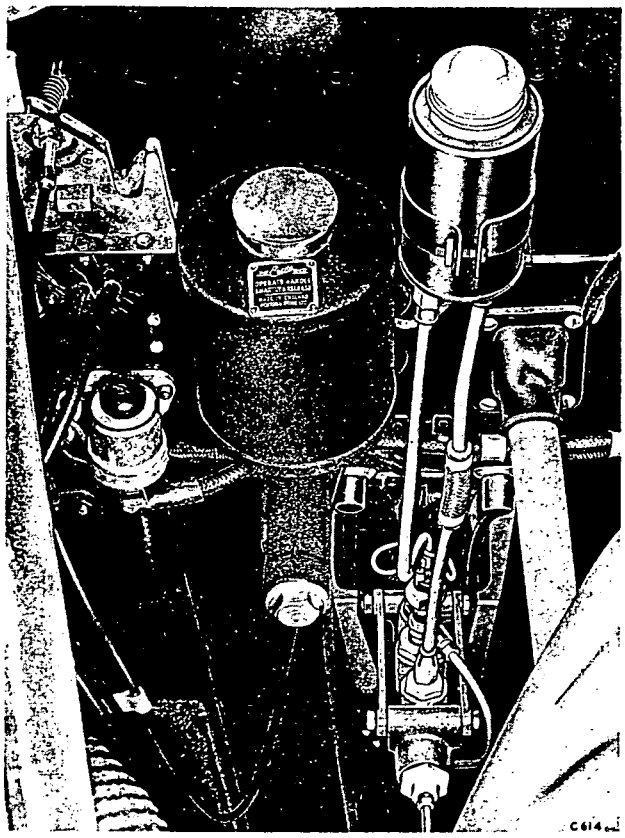


Fig. 150. Tandem master cylinder

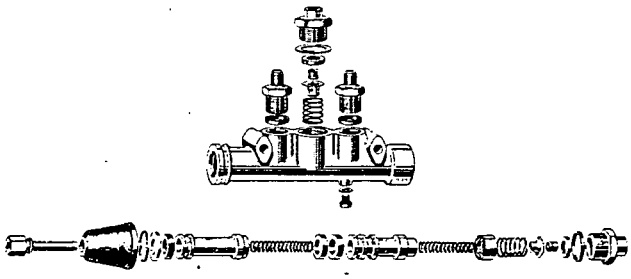


Fig. 151. Tandem master cylinder detail parts

At the threaded end, insert a spring into the end of the piston, then fit the stop and then the valve spring. Fit a valve cup into the valve body, then a rubber valve washer and rubber seal to the outlet adaptor, insert the valve body and screw in the adaptor.

Stretch a rubber seal into the recess of the primary piston, larger diameter to the inside, fit a spring between the pistons and insert the primary piston, seal end last. Fit the stop washer, press the primary piston down with a suitable tool and insert the circlip.

Through the inlet aperture ease back the secondary piston and screw in the stop pin with its washer into the long recess of the piston.

Fit a valve cup to the remaining valve body and a rubber valve washer to the outlet adaptor, then fit the spring and valve body and screw in the outlet adaptor with its gasket.

Fit seals to the two inlet adaptors and screw them partially in. With the cylinder held firmly in a vice press hard on the piston at the push rod end with a suitable rod causing both pistons to move rearwards. With the piston in this position screw in and tighten the inlet adaptors.

Refitting to the Pedal Cradle

Position the cylinder into the pedal cradle, at the same time inserting the push rod. Fit the rubber boot. Fit the two securing bolts, shakeproof washers and nuts and tighten. Check the adjustment of the brake pedal as described. Joint the two feed pipes from the supply tank to the inlet adaptors and refill the tank with fluid.

Test the operation by operating the brake pedal and allowing it to return unassisted. After a few applications the fluid should flow from the control and front outlets.

Connect the banjo bolt and its pipe line to the central adaptor and fit the stop light. Connect the pipe line to the front outlet.

Finally bleed the brakes and check for leaks by applying pressure to the brake pedal.

Connect the leads to the stop light switch, connect the battery and check the stop light.

Integral Master Cylinder Lockheed Part No. 88839

Removing

Disconnect the battery and referring to Fig.152 disconnect the leads from the stop light switch. Unscrew the banjo bolt from the head of the cylinder and release the brake pipes. Remove the bolts securing the cylinder to the pedal cradle and lift the cylinder clear, leaving the rubber boot and push rod attached to the pedal linkage.

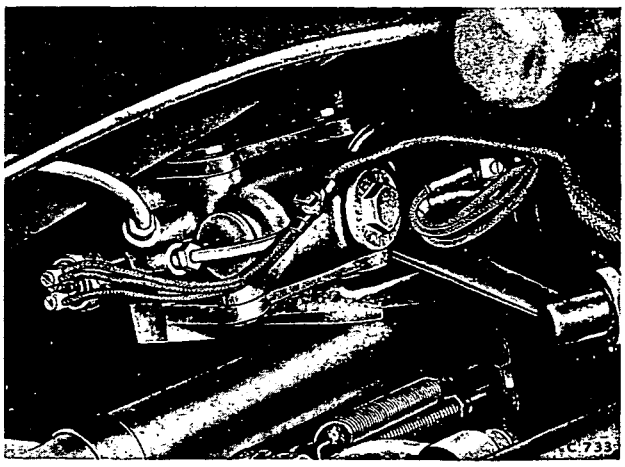


Fig. 152. Integral master cylinder

Unscrew the filler cap and empty the fluid into a clean container.

Dismantling Fig.153.

Push the piston down the cylinder bore slightly to release any pressure on the piston stop, then remove the circlip. All internal parts may then be withdrawn.

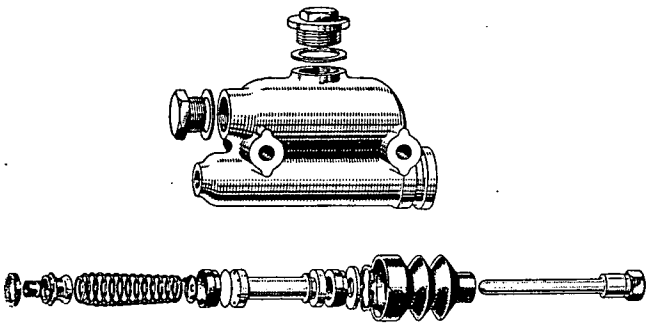


Fig. 153. Integral master cylinder detail parts

Re-assembling

Replacement rubber parts are:-

Main Cup.....Lockheed 112.
Secondary Cup.....Lockheed 400.
Valve Cup.....Lockheed 608.
Valve Washer.....Lockheed 3590.
Boot.....Lockheed 437.

Wash all parts thoroughly. If rubber parts are being used again clean with brake fluid.

Ensure that the by-pass port and the vent holes in the filler cap are clear. Dip all parts in brake fluid and assemble wet.

Stretch the secondary cup over the piston and locate it in its recess. Fit the valve washer and valve cup to the valve body and fit the assembly to the larger end of the return spring with the spring retainer at the smaller end. Insert the assembly valve first into the cylinder.

Insert the main cup taking care not to turn back the lip and press it down to the spring retainer. Insert the piston washer then the piston with its secondary cup.

Push the piston a short way into the bore, insert the piston stop and then the circlip.

Refitting to the Pedal Cradle

Position the cylinder in the pedal cradle, at the same time inserting the push rod. Fit the rubber boot. Fit the bolts, shakeproof washers and nuts and tighten securely. Check the adjustment of the brake pedal as described.

Fill the cylinder with clean Lockheed brake fluid and test the operation by operating the brake pedal and allowing it to return unassisted. After a few applications fluid should flow from the outlet.

Connect up the banjo bolt of the pipe lines and bleed the system.

Check the system for leaks by applying firm pressure to the brake pedal.

Connect the leads to the stop light, connect the battery and check the stop light.

Front Wheel Brake Cylinder Lockheed Part No. 30635

Removing from the Backplate

First carry out the instructions for the removal of the brake shoes.

Then remove the flexible pipe to instructions.

Unscrew the banjo bolt from both cylinders and remove the banjo connectors, bridge pipe and gaskets. Remove the securing nuts and withdraw the cylinders.

Dismantling Fig.154.

Remove the clip or wire and remove the rubber boot with the piston.

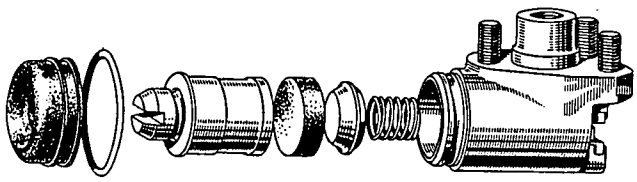


Fig. 154. Front wheel brake cylinder detail parts

Taking care not to damage the bore, hook out the rubber cup at the same time releasing the cap filler and spring.

Re-assembling

Replacement rubber parts are:-

Cup.....Lockheed 2762.
Boot.....Lockheed 30632.

Thoroughly clean all parts. If the rubber cup is being used again clean with brake fluid.

Examine the bore of the cylinder and polish out any roughness. If scored badly replace the cylinder. Dip the parts in brake fluid and assemble wet.

Fit the cup with its cup filler and spring taking care not to damage or turn back the lip of the cup. Insert the piston, fit the rubber boot and secure with the clip or soft wire.

Refitting to the Backplate

Fit the cylinders to the backplate and secure with the three spring washers and nuts.

Secure the banjo adaptors complete with bridge pipe by inserting the banjo bolts into the cylinders, making pressure tight joints with the gaskets.

Attach the flexible pipe to the banjo bolt of the upper

cylinder and tighten to make a pressure tight joint.

Secure the flexible pipe and fit the brake shoes as instructed and bleed the system.

Check for leaks by applying firm pressure to the brake pedal.

Rear Brake Cylinder Lockheed Part No. 83604

Removing from the Backplate

First carry out the instructions for the removal of the brake shoes.

From there remove the banjo bolt securing the banjo adaptor at the rear of the backplate. Remove the gaiter then disconnect the fork end from the brake cylinder lever. Remove the rubber boot from the lever.

Tilt the wheel cylinder and manoeuvre it from the slot in the backplate.

Dismantling Fig.155.

Remove the piston and dust cover and sealing ring. Push out the lever pivot pin, withdraw the lever and shake out the inner piston.

Taking care not to damage the bore, hook out the rubber cup at the same time releasing the cup filler and spring.

Re-assembling

Replacement rubber parts are:-

Cup .....Lockheed 2762.
Boot .....Lockheed 35415.

Thoroughly clean all parts. If the rubber cup is being used again clean with brake fluid. Examine the bore of the cylinder and polish out any roughness. If scored badly replace the cylinder. Dip all internal parts in brake fluid and assemble wet.

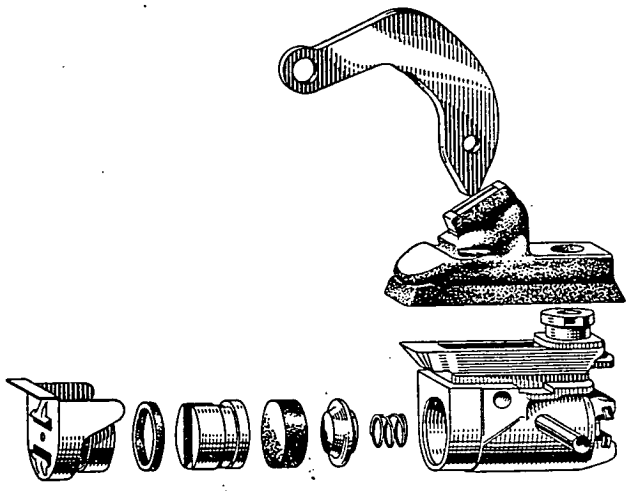


Fig. 155. Rear wheel brake cylinder detail parts

Insert the cup filler in the cup then fit this assembly, spring first, into the cylinder, taking care not to damage or turn back the lip of the cup.

Insert the inner piston, slot to the open end and aligned with the lever slot. Insert the lever with the crank towards the open end of the cylinder and secure it with the pivot pin.

Fit the seal and then the piston and dust cover.

Refitting to the Backplate

Offer the cylinder to the backplate with the lever facing to the rear, then manoeuvre the cylinder into position in the slot. Fit the rubber boot.

Connect the banjo adaptor to the cylinder with the banjo bolt making a pressure tight joint. Secure the fork end to the lever and fit the gaiter.

Fit the brake shoes as instructed.

Finally bleed the system and check for leaks by applying firm pressure to the brake pedal.

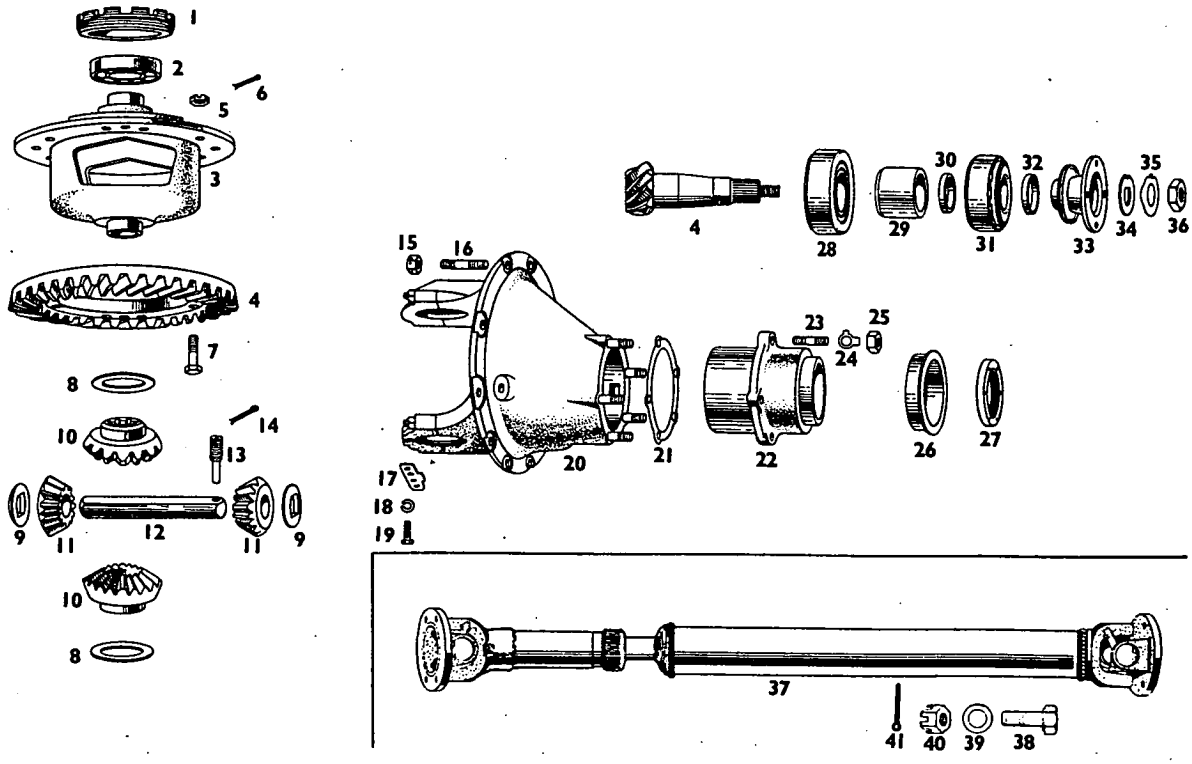
Differential Unit

List of Contents

Differential Unit

TYPE 405. DIFFERENTIAL GEAR UNIT. SERIAL 405-1-30003. DETACHABLE BEARING HOUSING AND PROPELLOR SHAFT.

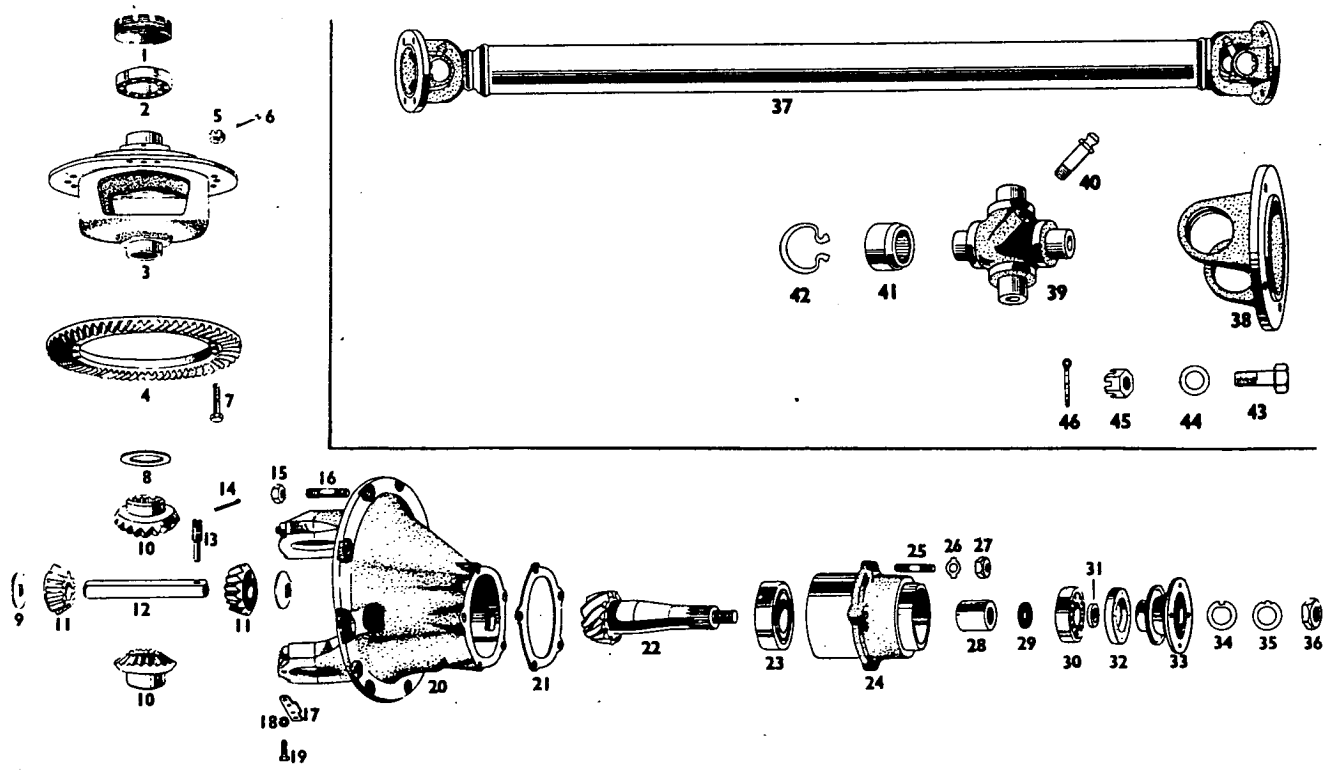
Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.490271	1	Locking Ring	2	N.721023-3	21	Shim .005 thickness	selec-
N.490361	2	Roller Bearing	2	N.721023-4		Shim .010 thickness	tive
405-1-30051/1	3	Crown Wheel Mounting	1	N.721923-5		Shim .015 thickness	
405-1-30018/1	4	Driving Pinion) Paired	1	N.721023-6		Shim .020 thickness	
405-1-30018/2		Crown Wheel)	1	N.721018	22	Bearing Housing	1
FN405/L	5	Slotted Nut	12	N.721006	23	Bearing Housing Retaining Stud	5
-	6	Split Pin 1/16" dia. ¾" long	12	N.310380	24	Tabwasher	5
N.490291	7	Crown Wheel Bolt	12	FN105/L	25	Nut 5/16" BSF	5
N.490141-1		Thrust Washer .102 thickness		-	26	Not used on 405-1-30003	
N.490141-2		Thrust Washer .104 thickness		N.721011	27	Oil Seal	1
N.490141-2A		Thrust Washer .107 thickness		N.721022	28	Taper Roller Bearing	1
N.490141-2B		Thrust Washer .105 thickness		N.721004-1		Distance Piece 1.423 long	1
N.490141-3		Thrust Washer .110 thickness		N.721004-2	29	Distance Piece 1.443 long	selec-
N.490141-4		Thrust Washer .112 thickness		N.721004-3		Distance Piece 1.463 long	tive
N.490141-5	8	Thrust Washer .114 thickness	2	N.721014-1		Distance Washer .200 thickness	
N.490141-6		Thrust Washer .116 thickness	selec-	N.721014-2		Distance Washer .202 thickness	
N.490141-7		Thrust Washer .125 thickness	tive	N.721014-3		Distance Washer .204 thickness	
N.490141-8		Thrust Washer .130 thickness		N.721014-4		Distance Washer .206 thickness	
N.490141-9		Thrust Washer .118 thickness		N.721014-5		Distance Washer .208 thickness	
N.490141-10		Thrust Washer .120 thickness		N.721014-6	30	Distance Washer .210 thickness	
N.490141-11		Thrust Washer .122 thickness		N.721014-7		Distance Washer .212 thickness	1
N.490171-1		Spherical Thrust Washer .219 thickness		N.721014-8		Distance Washer .214 thickness	selec-
N.490171-2		Spherical Thrust Washer .221 thickness		N.721014-9		Distance Washer .216 thickness	tive
N.490171-3	9	Spherical Thrust Washer .228 thickness	2	N.721014-10		Distance Washer .218 thickness	
N.490171-4		Spherical Thrust Washer .231 thickness	selec-	N.721014-11		Distance Washer .220 thickness	
N.490171-5		Spherical Thrust Washer .234 thickness	tive	N.721009	31	Taper Roller Bearing	1
N.490051	10	Bevel Gear	2	N.721005	32	Distance Washer	1
N.490061	11	Bevel Pinion	2	N.721013	33	Companion Flange & Dust Seal	1
N.490471	12	Gear Spindle	1	N.490201	34	Special Washer	1
N.490161	13	Lock Pin	1	N.490251	35	Tabwasher	1
-	14	Split Pin 1/16" dia. ½" long	1	FN212/K	36	Thin Nut ¾" BSF	1
N.490481	15	Special Nut	4				
N.490261	16	Bearing Cap Attachment Stud	4				
N.490131	17	Locking Plate	2			PROPELLOR SHAFT	
-	18	Spring Washer 2BA	2	405-1-20132	37	Propellor Shaft	1
-	19	Setscrew 2BA Hex Hd ½" long	2	N.704117	38	Bolt	8
N.721017	20	Differential Gear Housing	1	N.704115	39	Plain Washer	8
N.721023-1		Shim .002 thickness		N.704116	40	Nut-Slotted	8
N.721023-2		Shim .004 thickness		-	41	Split Pin 3/32 dia. x 1" long	8



TYPE 404. DIFFERENTIAL GEAR UNIT AND PROPELLOR SHAFT.

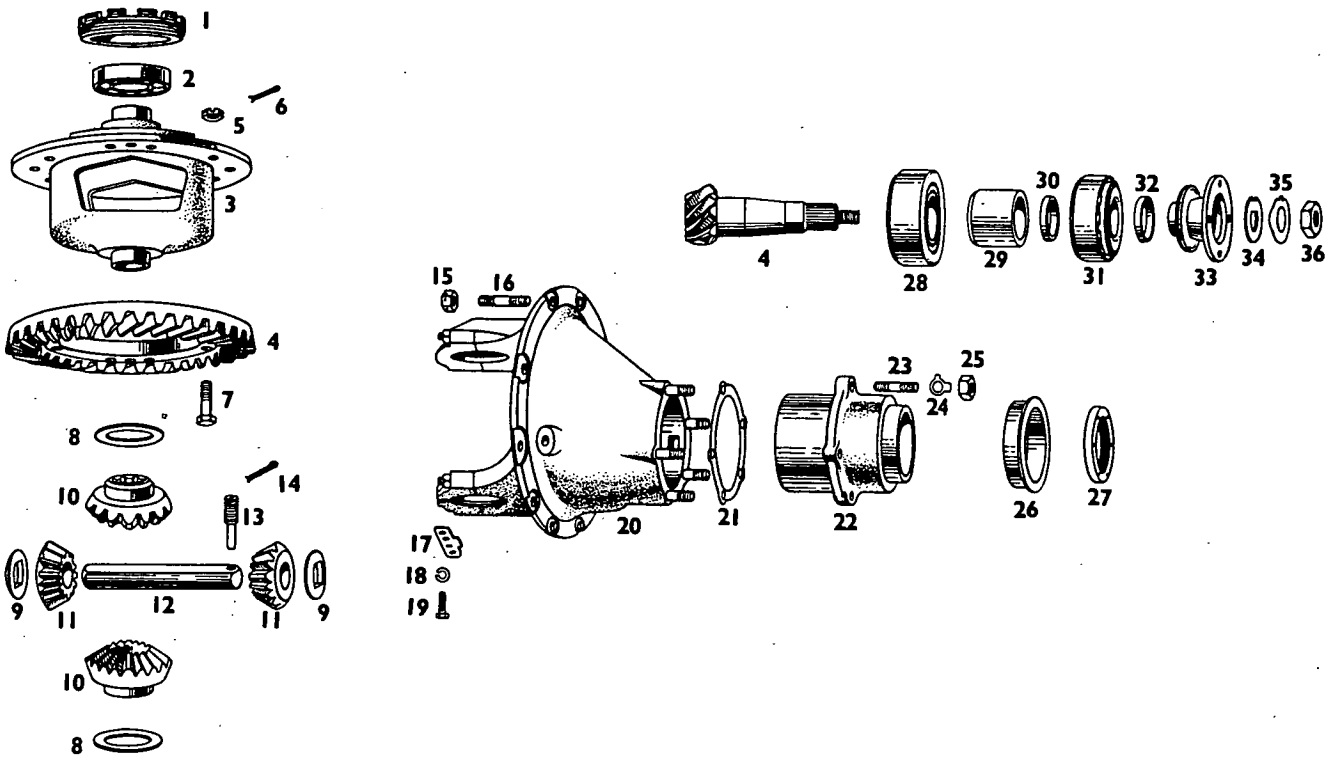
Part No.	Item	Description	No. off per car
N.490271	1	Locking Ring	2
N.490361	2	Bearing	2
N.490031	3	Crown Wheel Mounting (Complete)	1
N.490231	4	Crown Wheel	1
N.490460	5	Nut Slotted 5/16 BSF	12
-	6	Split Pin 1/16 Dia. x ¾	12
N.490291	7	Bolt	12
N.490141-1	8	Thrust Washer. Thickness) .102 .000 - .001.)	2
N.490141-2		Thrust Washer. Thickness) .104 .000 - .001)	2
N.490141-3		Thrust Washer. Thickness) .110 .001 - .000) Selective	2
N.490141-4		Thrust Washer. Thickness) Assy. .112 .002 - .000)	2
N.490141-5		Thrust Washer. Thickness) .114 .001 - .000)	2
N.490141-6		Thrust Washer. Thickness) .116 .001 - .000)	2
N.490171-1	9	Spherical Thrust Washer) Thickness .219 .001 - .000)	2
N.490171-2		Spherical Thrust Washer) Thickness .221 .001 - .000))	2
N.490171-3		Spherical Thrust Washer) Thickness .228 .001 - .000) Selective	2
N.490171-4		Spherical Thrust Washer) Assy. Thickness .231 .001 - .000)	2
N.490171-5		Spherical Thrust Washer) Thickness .234 .001 - .000)	2
N.490051	10	Bevel Gear	2
N.490061	11	Bevel Pinion	2
N.490471	12	Gear Spindle	1
N.490161	13	Lock Pin	1
-	14	Split Pin 1/16 x ½	1
N.490301	15	Special Nut 7/16 BSF	4
N.490261	16	Bearing Cap Attachment Stud	4
N.490131	17	Locking Plate	2
-	18	Spring Washer 2 BA	2
-	19	Set Screw 2 BA Hex Head ½ Long	2

Part No.	Item	Description	No. off per car
N.721017	20	Differential Gear Housing Complete	1
N.721007	21	Adjustable Washer	1
N.490021	22	Driving Pinion	1
N.721010	23	Taper Roller Bearing	1
N.721018	24	Bearing Housing	1
N.721006	25	Stud	5
AGS195-2	26	Tabwasher	5
FN105/L	27	Nut 5/16 BSF	5
N.721004-1	28	Distance Piece 1.423)	1
N.721004-2		Distance Piece 1.443) Selective	1
N.721004-3		Distance Piece 1.463) Assy.	1
N.721014-1	29	Distance Washer. Thickness).200)	1
N.721014-2		Distance Washer. Thickness .202)	1
N.721014-3		Distance Washer. Thickness .204)	1
N.721014-4		Distance Washer. Thickness .206)	1
N.721014-5		Distance Washer. Thickness .208)	1
N.721014-6		Distance Washer. Thickness .210) Selective	1
N.721014-7		Distance Washer. Thickness).212) Assy.	1
N.721014-8		Distance Washer. Thickness .214)	1
N.721014-9		Distance Washer. Thickness .216)	1
N.721014-10		Distance Washer. Thickness .218)	1
N.721014-11		Distance Washer. Thickness .220)	1
N.721009	30	Taper Roller Bearing	1
N.721005	31	Distance Washer	1
N.721011	32	Oil Seal	1
N.721013	33	Companion Flange, and Dust Seal	1
N.490201	34	Special Washer	1
N.490251	35	Tabwasher	1
FN212/K	36	Nut Thin ¾ BSF	1
404-X-20142	37	Propellor Shaft	1
N.704145	38	Flange Yoke	2
N.704146	39	Journal Assy.	2
N.480161	40	Lubrication Nipple	2
N.704147	41	Needle Bearing Assy.	8
N.704148	42	Circlip	8
N.704117	43	Bolt	8
-	44	Washer 3/8 Plain	8
N.704116	45	Nut	8
-	46	Split Pin	8



TYPE 405. DIFFERENTIAL GEAR UNIT-DETACHABLE BEARING HOUSING. SERIAL 405-1-30052

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.490271	1	Locking Ring	2	N.721023-3		Shim .005 thickness	
N.490361	2	Roller Bearing	2	N.721023-4	21	Shim .010 thickness	selec-
405-30051/1	3	Crown Wheel Mounting	1	N.721023-5		Shim .015 thickness	tive
405-1-30049/1	4	Driving Pinion) Paired	1	N.721023-6		Shim .020 thickness	
405-1-30049/2		Crown Wheel)	1	405-1-30047	22	Bearing Housing	1
FN.405/L	5	Slotted Nut	12	N.721006	23	Bearing Housing Retaining Stud	5
-	6	Split Pin 1/16" dia. ¾" long	12	N.310380	24	Tabwasher	5
N.490291	7	Croan Wheel Bolt	12	FN.105/L	25	Nut 5/16" BSF	5
N.490141-1		Thrust Washer .102 thickness		405-1-30044	26	Oil Seal Adaptor	1
N.490141-2		Thrust Washer .104 thickness		N.721011	27	Oil Seal	1
N.490141-2A		Thrust Washer .107 thickness		405-1-30032	28	Taper Roller Bearing	1
N.490141-2B		Thrust Washer .105 thickness		405-1-30038-1		Distance Piece 1.466 long	
N.490141-3		Thrust Washer .110 thickness		405-1-30038-2	29	Distance Piece 1.486 long	1
N.490141-4		Thrust Washer .112 thickness		405-1-30038-3		Distance Piece 1.506 long	selec-
N.490141-5	8	Thrust Washer .114 thickness	2	405-1-30038-4		Distance Piece 1.526 long	tive
N.490141-6		Thrust Washer .116 thickness	selec-	405-1-30045-1		Distance Washer .200 thickness	
N.490141-7		Thrust Washer .125 thickness	tive	405-1-30045-2		Distance Washer .202 thickness	
N.490141-8		Thrust Washer .130 thickness		405-1-30045-3		Distance Washer .204 thickness	
N.490141-9		Thrust Washer .118 thickness		405-1-30045-4	30	Distance Washer .206 thickness	1
N.490141-10		Thrust Washer .120 thickness		405-1-30045-5		Distance Washer .208 thickness	selec-
N.490141-11		Thrust Washer .122 thickness		405-1-30045-6		Distance Washer .210 thickness	tive
N.490171-1		Spherical Thrust Washer .219 thickness		405-1-30045-7		Distance Washer .212 thickness	
N.490171-2		Spherical Thrust Washer .221 thickness		405-1-30045-8		Distance Washer .214 thickness	
N.490171-3		Spherical Thrust Washer .228 thickness		405-1-30045-9		Distance Washer .216 thickness	
N.490171-4	9	Spherical Thrust Washer .231 thickness	2	405-1-30045-10		Distance Washer .218 thickness	
N.490171-5		Spherical Thrust Washer .234 thickness	selec-	405-1-30045-11		Distance Washer .220 thickness	
			tive	405-1-30045-12		Distance Washer .209 thickness	
N.490051	10	Bevel Gear	2	405-1-30045-13		Distance Washer .211 thickness	
N.490061	11	Bevel Pinion	2	405-1-30045-14		Distance Washer .213 thickness	
N.490471	12	Gear Spindle	1	405-1-30045-15		Distance Washer .215 thickness	
N.490161	13	Lock Pin	1	405-1-30045-16		Distance Washer .217 thickness	
-	14	Split Pin 1/16" dia. ½" long	1	405-1-30045-17		Distance Washer .219 thickness	
N.490481	15	Special Nut	4	405-1-30045-18		Distance Washer .221 thickness	
N.490261	16	Bearing Cap Attachment Stud	4	405-1-30033	31	Taper Roller Bearing	11
N.490131	17	Locking Plate	2	405-1-30041	32	Distance Washer	1
-	18	Spring Washer 2BA	2	N.721013	33	Companion Flange & Dust Seal	1
-	19	Setscrew 2BA Hex Hd ½" long	2	N.490201	34	Special Washer	1
N.721017	20	Differential Gear Housing	1	N.490251	35	Tabwasher	1
N.721023-1		Shim .002 thickness		FN.212/K	36	Thin Nut ¼" BSF	1
N.721023-2		Shim .004 thickness					



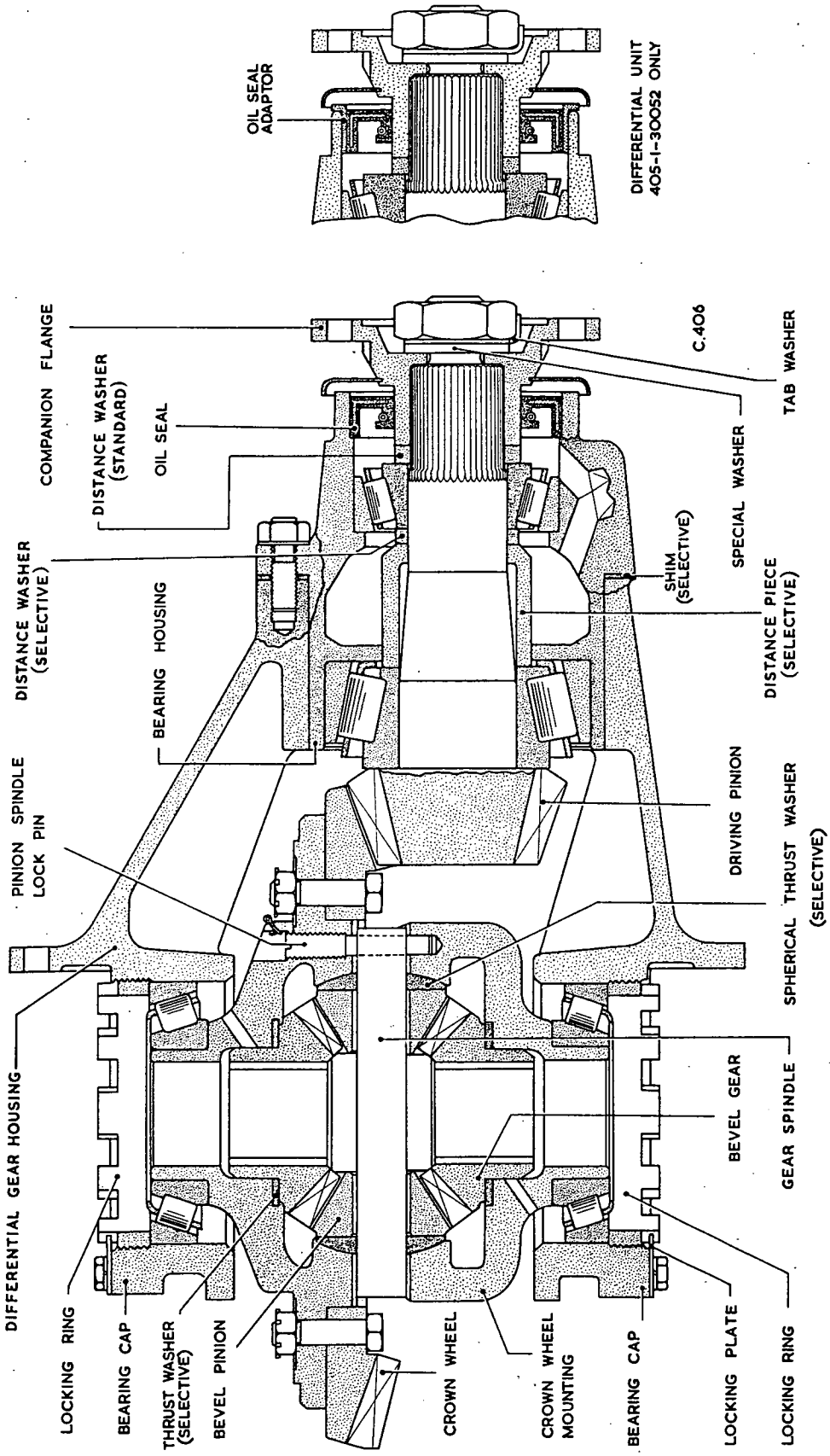


Fig. 156. Assembly of differential unit (Detachable bearing housing)

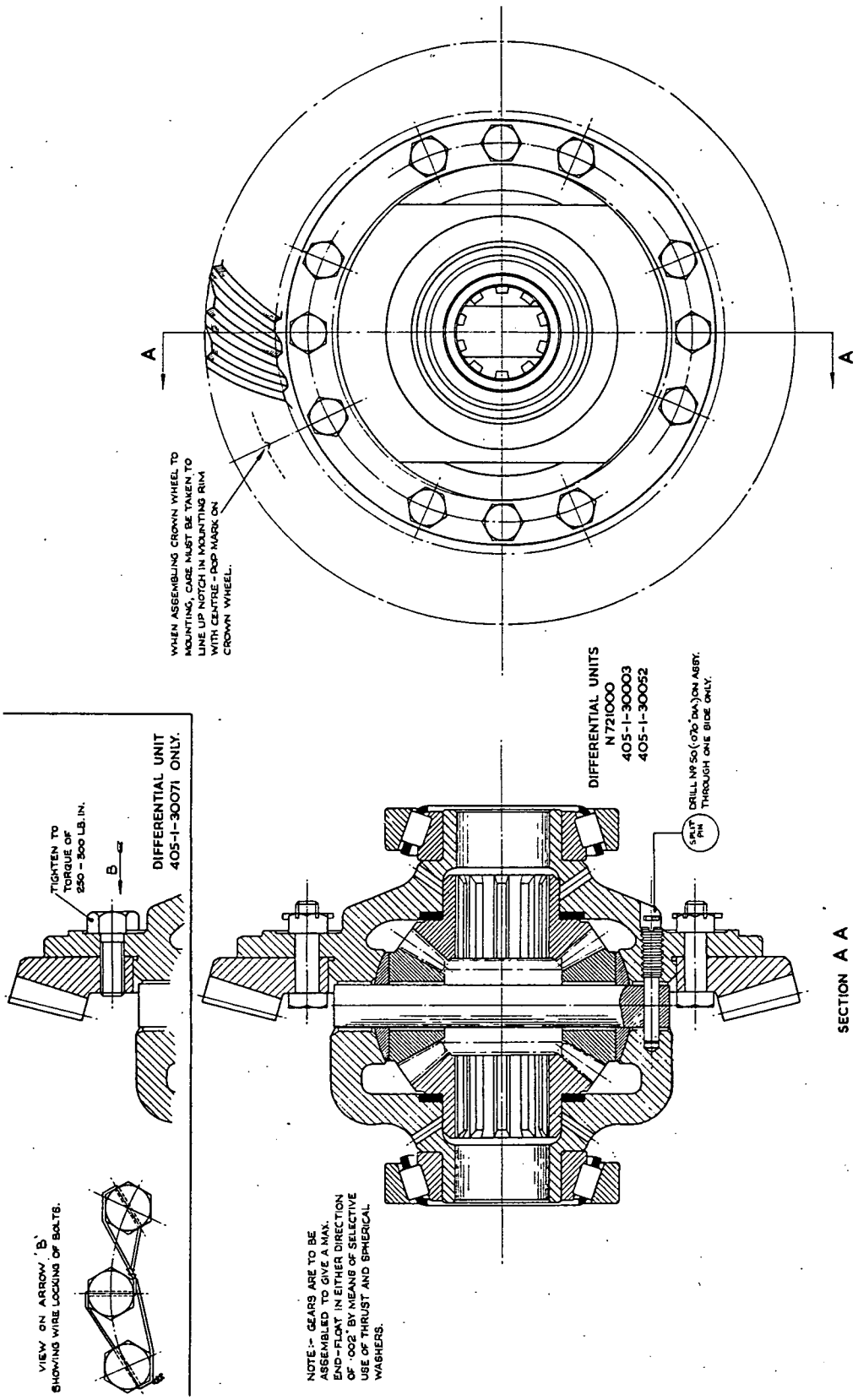


Fig. 157. Assembly of crown wheel mounting

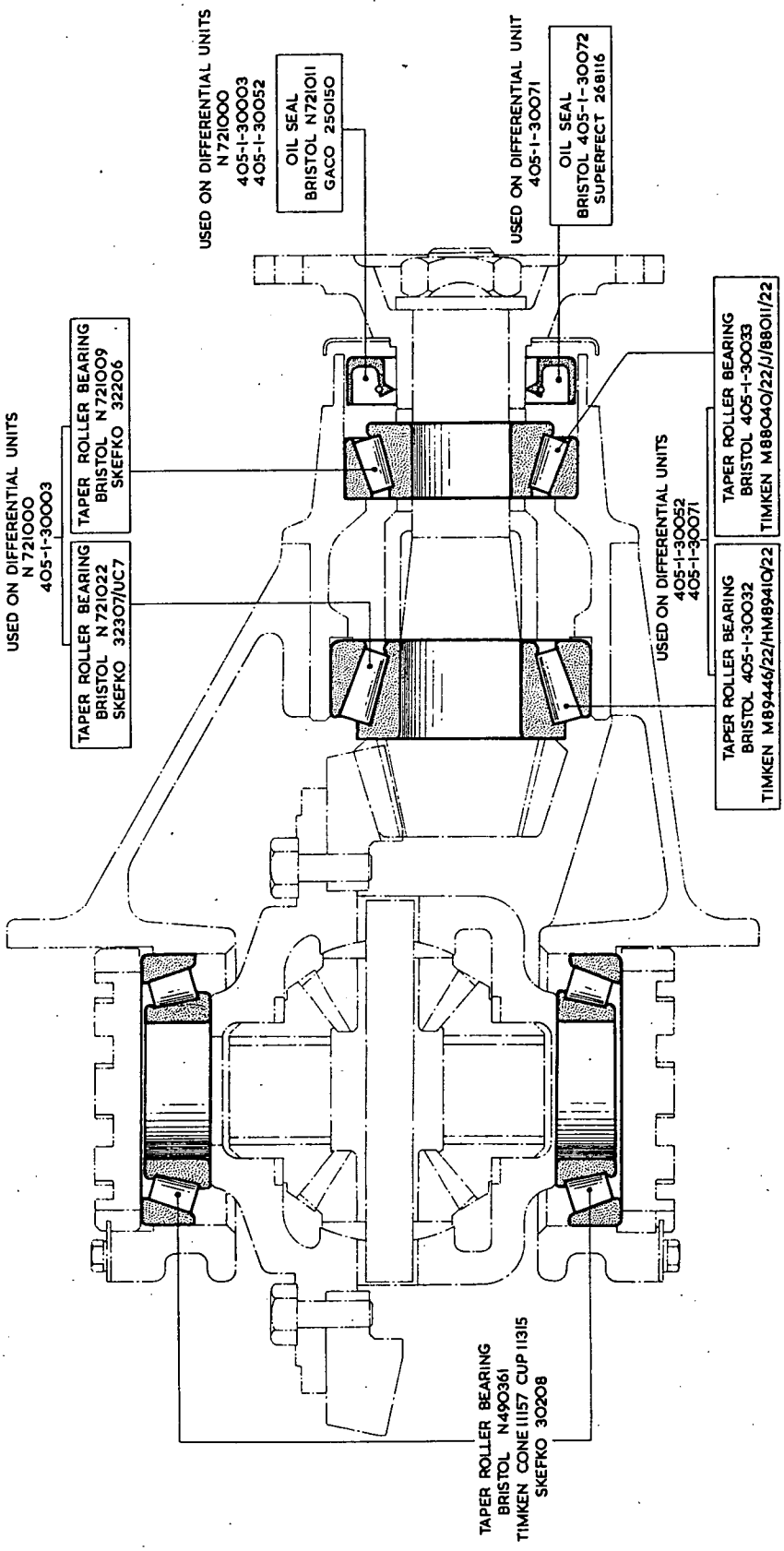


Fig. 158. Roller race and oil seal diagram

Differential Unit

The differential unit used on the Type 404 Car is 3.9 Ratio and identical with the differential used on the previous Type 401 and Type 403 Cars. The part number of this unit is N.721000.

The differential used on early Type 405 Cars is identical with N.721000 except that the ratio changed to 4.22. The part number of this unit is 405-1-30003.

On intermediate Type 405 Cars the taper roller races in the pinion bearing housing were changed. This changed the diameter of the pinion and consequently the crown wheel and pinion are non-interchangeable with previous differentials. The part number of this unit is 405-1-30052.

On later Type 405 Cars numerous changes were made, the bearing housing being shrunk into the casing and is not detachable. The crown wheel and pinion are changed and are not interchangeable with previous types. The part number of this unit is 405-1-30071.

In all instances the differential units are completely interchangeable in the 'Bristol' Cars as units. Only the component parts have been subject to alteration.

Removing and Refitting to the Car

Type 404 and 405.

Drain the rear axle, jack up the car and support the rear on chassis stands. Referring to the Rear Suspension for the procedure withdraw the half shafts from the splines on the differential. Detach the attachment unit from the top of the differential.

Disconnect the propellor shaft from the differential companion flange and push the propellor shaft forward towards the gearbox.

Release the tabwashers, remove the nuts and lift it forward clear of the axle casing.

To refit, clean the joint faces of the axle casing and the differential and fit a new gasket over the studs.

Fit the assembly to the axle casing, replace the tabwashers and nuts and tighten evenly and lock.

Reconnect the propellor shaft, attachment unit and refit the half shafts. Fill with approved oil.

Replacing the Driving Pinion Oil Seal

From below the car disconnect the propellor shaft rear companion flange and push the shaft forward.

Remove the nut, lockwasher and special washer and using extractor TFN8450 remove the companion flange from the splines of the driving pinion.

Prise out the oil seal and fit a new seal lip inwards and with the face flush with the face of the bearing housing.

Check the running surface of the companion flange for condition where it fits the seal and polish or replace if necessary. Lubricate and fit the companion flange with its special washer, lockwasher and nut and tighten and lock. Refit the propellor shaft.

Dismantling the Unit

This procedure applies only to differential units stamped with the following Part Numbers.

N.721000.....3.9 Ratio. Fitted to Type 404 cars.

405-1-30003.....4.22 Ratio. Fitted to early Type 405 cars.

405-1-30052.....4.22 Ratio. Fitted to intermediate Type 405 Cars.

For dismantling 405-1-30071 refer to a separate procedure.

With the unit removed from the car refer to Fig.156 and proceed to dismantle as follows:-

Locate and bolt the complete assembly on to Vice Plate TFN5053.

Unlock the tabwasher and remove the nut, tabwasher and special washer from the companion flange.

Remove the locking plates from both bearing caps and remove the locking wire from the bearing cap nuts. Remove the nuts, bearing caps and the locking rings and lift out the crown wheel mounting complete.

Unlock and remove the five nuts securing the pinion bearing housing and withdraw this assembly which is a good slide fit. The joint on the five studs is a laminated adjustable washer or separate thin shims which control the penetration of the pinion to the crown wheel. In most instances they should be carefully retained.

Proceed to dismantle the Crown Wheel Mounting:-

If the taper roller bearings are unserviceable, remove them from the crown wheel mounting spigot with extractor tool TFN5057 see Fig.159

Remove the split pins, nuts and bolts and remove the

crown wheel. Remove the split pin retaining the pinion spindle lock pin and unscrew the pin. Drift out the bevel pinion spindle.

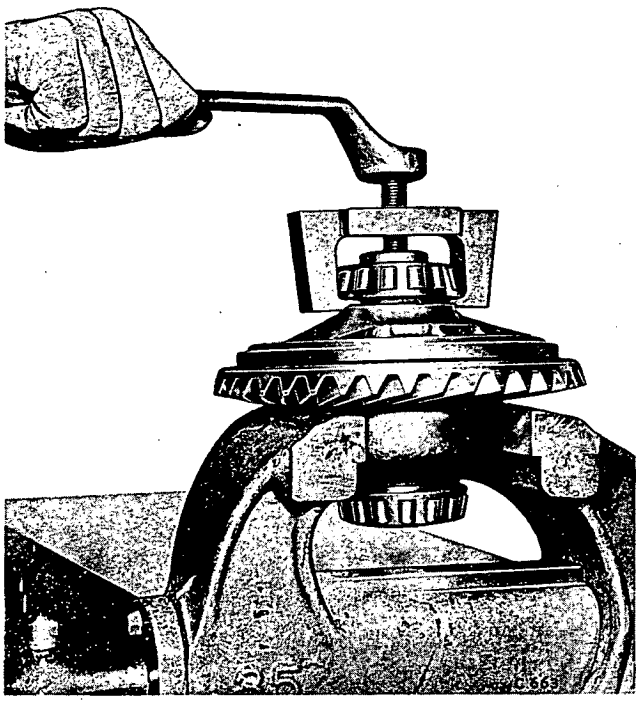


Fig. 159. Removing roller races from crown wheel mounting

Remove each pinion together with its spherical thrust washer and keep them together noting the location. Remove the bevel gears.

Phosphor bronze thrust washers are pressed into a recess in the bevel gear location. These are a selective assembly and should only be removed if replacements are necessary. Small holes are provided to enable them to be tapped out but the holes are only accessible when the roller bearings have been removed.

To dismantle the bearing housing use the following procedure:-

Having previously removed the nut, use extractor TFN8450 and withdraw the companion flange from its splines on the pinion.

With the rear face of the bearing housing suitably supported press out the driving pinion. The bearing inner race and rollers and the selective distance piece and distance washer will remain on the pinion. Take out the standard distance piece between the roller race and the oil seal.

Reverse the bearing housing and press out the oil seal together with the inner race and rollers of the front bearing. Discard the oil seal.

If the roller bearings are to be replaced it will be necessary to remove both the outer races from the bearing housing and the inner race from the driving pinion by the following method.

Using the tools TFN5058 and TFN5059 remove the roller race as shown in Fig.160.

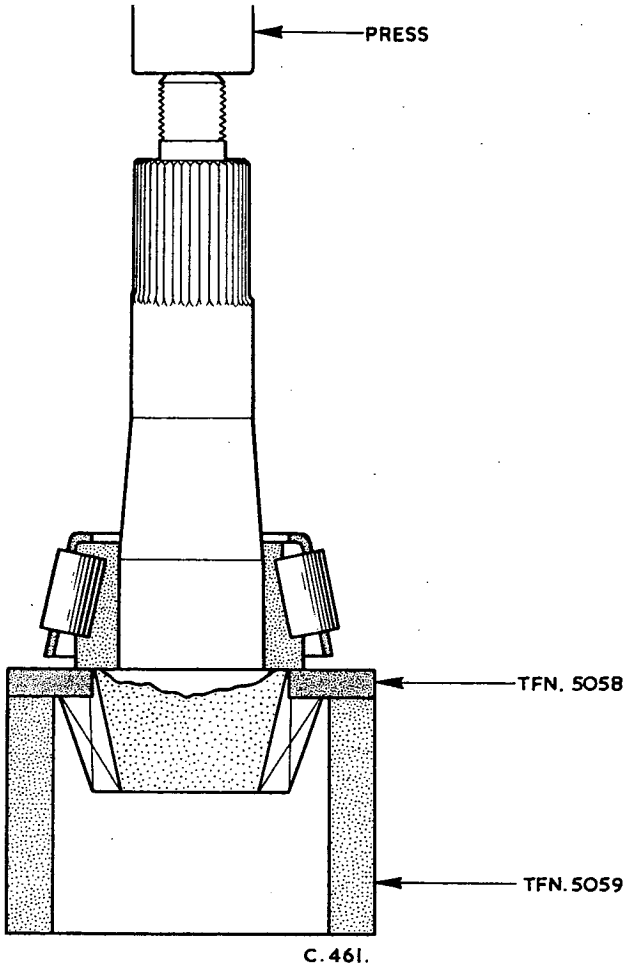


Fig. 160. Removing roller race from pinion

Using the spigots TFN5060 and TFN5061 and the rings TFN5062 and TFN5071, press out the bearing outer races (larger race first) as shown in Fig.161.

Re-assembling the Bearing Housing

It is assumed that this assembly would not have been disturbed except for replacement of the pinion, roller races or the housing itself. This means that the removed distance piece and distance washer would not now be suitable to produce the pre-load of 8-10 lbs. which is necessary to turn the pinion before meshing with the crown wheel.

To obtain this figure in manufacture a dummy pinion is used but failing the availability of this tool then it means 'trial and error' by pressing on and off the taper roller bearing and adding or subtracting from the distance pieces until the desired torque is obtained.

For general instruction the process using the dummy pinion is given herewith:-

Press into position the two roller bearing outer races,

with the large diameters of the taper facing outwards, until they are hard on their respective shoulders.

distance washer then fit the oil seal, followed by the companion flange, special washer, tabwasher and nut.

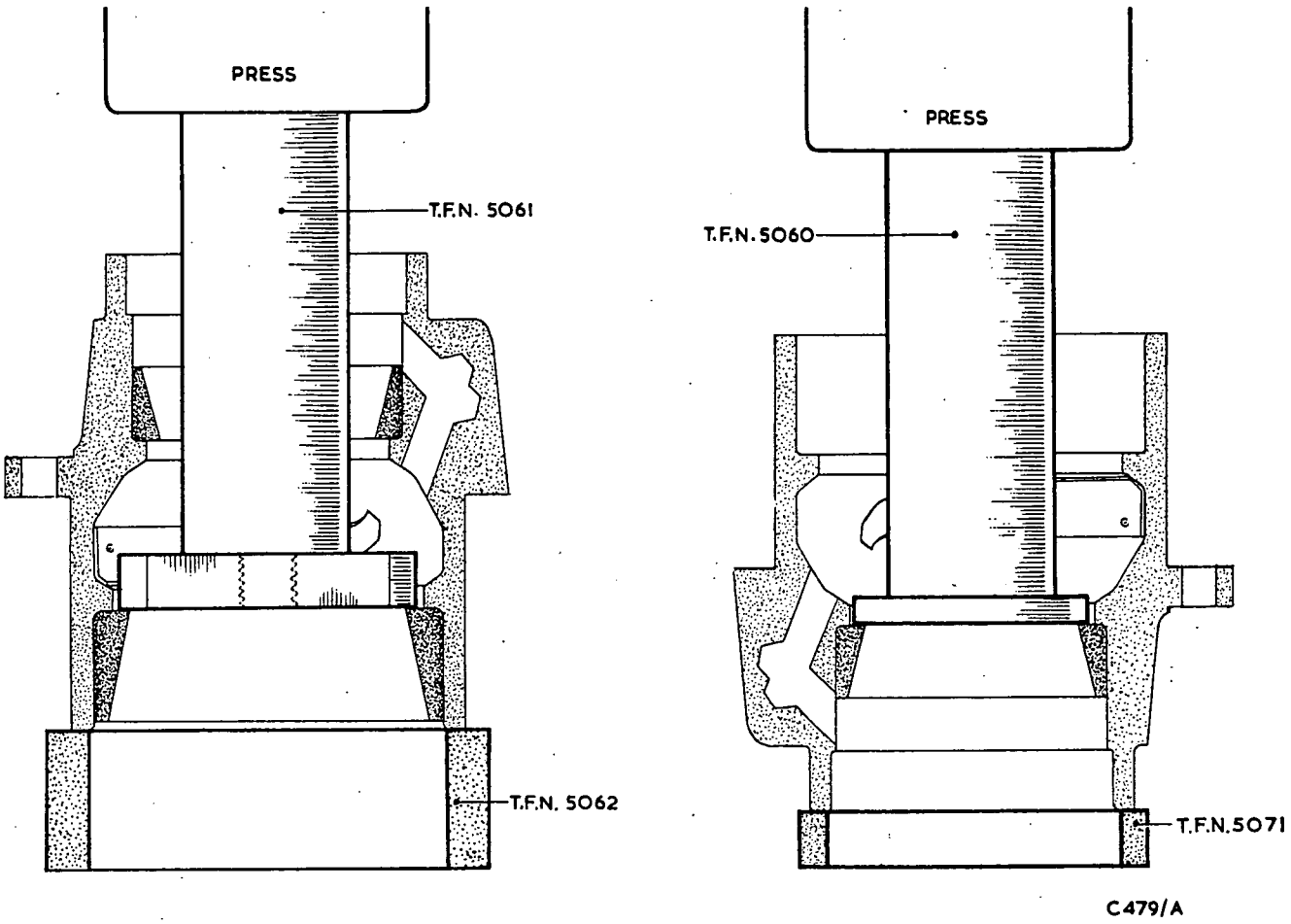


Fig. 161. Removing outer races from the bearing housing

Using the dummy driving pinion TFN5063 completely assemble the bearing housing, less oil seal, and tighten the nut securely with spanners TFN5054 and TFN5055 see Fig.162.

If the assembly locks solid during this process the distance piece and/or distance washer is too short. Conversely, should the housing revolve freely after tightening check the end float to determine the reduction to make to the distance piece or washer.

When the correct pre-load of 8-10 lbs/ins has been determined, using a torque spanner or spring balance, the parts should all be dismantled from the dummy pinion and assembled to the driving pinion in the following manner:-

Referring to Fig.156 press the larger roller inner race on the pinion until it is hard against the pinion head. Then fit the distance piece and distance washer and insert this assembly into the bearing housing.

Resting on the pinion face press the outer bearing fully home in the pinion shaft. Fit the standard size

Holding the bearing housing in Vice Plate TFN5052 and using spanners TFN5054 and TFN5055 tighten the nut. Test the pre-load figure and if correct lock the nut with the tabwasher.

Re-assembling the Crown Wheel Mounting.

Make sure that all components are clean and that all oil passages are clear. For assembly use the following procedure referring to Fig.157.

If the two phosphor bronze thrust washers in the crown wheel mounting have not been discarded leave them in position pending the end float check. If they are to be discarded, fit two new washers slightly thicker than those taken out. Refer to the Spares illustrations and lists for sizes available.

Preferably support the crown wheel mounting using Vice Plate TFN5056 and ten insert the bevel gears.

If the phosphor bronze spherical thrust washers have not been discarded, fit them, together with the bevel pinions. Refer to the Spares illustrations and lists for

the sizes of spherical thrust washers available. With the bevel pinions fitted, insert the spindle, aligning the hole with the locking pin position.

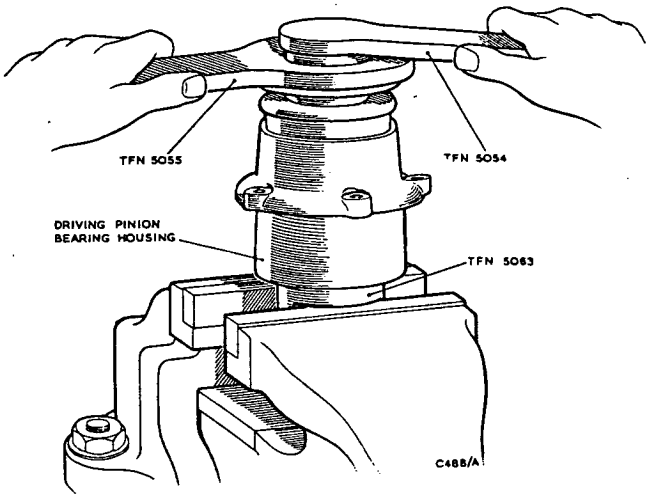


Fig. 162. Tightening bearing housing on dummy driving pinion

Using the key TFN5064 as shown in Fig.163 make sure that the pinions and gears are free to rotate, then check that each pinion and gear is free but without end float. Fig.164. If necessary correct by selecting suitable thrust washers. When this is satisfactory, fit the locking pin and lock with the split pin.

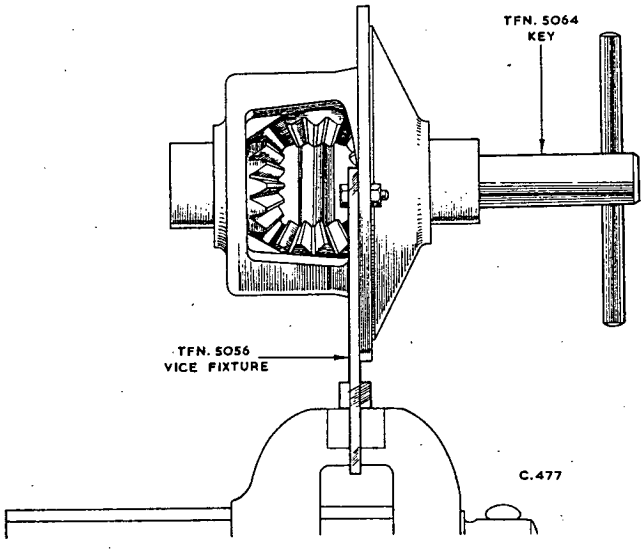


Fig. 163. Checking bevel pinions and bevel gears

Remove the assembly from the Vice Plate and fit the crown wheel, with the bolt heads on the inside of the gear. The centre punch mark on the crown wheel must line up with the notch on the rim of the mounting. Tighten the nuts evenly and securely but do not fit the split pins at this stage.

If the taper roller races have been rejected and removed, press the inner races of the new bearings on to the mounting spigots with the smaller diameter outwards.

Fig. 164. Checking bevel pinion and bevel gear end float

Final Assembly of the Differential Unit

The rear ball joint must be fitted to the differential casing, see Rear Suspension, before fitting the crown wheel mounting.

Support the differential casing using Vice Plate TFN5053. Fit the outer races to the roller bearings and fit the crown wheel mounting assembly to the differential casing. Temporarily fit the assembled driving pinion in order to position the crown wheel and fit the threaded locking rings to retain this position. Remove the driving pinion.

Fit the bearings caps, making sure that the locking rings can be moved freely in the threads then screw up the bearing caps to a torque figure of 28 lb./ft.

Fit the existing adjustable washer (now superseded by separate shims) over the five studs. Smear the pinion carefully with marking compound then fit the pinion bearing housing assembly into the casing. One stud is offset to provide the correct location. See that the crown wheel is free to revolve with the bearing housing fully in position and fit and tighten the nuts.

The correct marking Fig.165 should now be carried out using the adjustments provided i.e. The shims at the joint of the bearing housing and the locknuts on the crown wheel mounting. Keep all locations tight during this operation so that final tightening and locking would not alter the marking.

When the correct marking is obtained and using spanner TFN5065 check that the locking rings have a pre-load figure of 4 lb/inch. The backlash, crown wheel to pinion should not exceed .005 to .007 inch. See Fig.166.

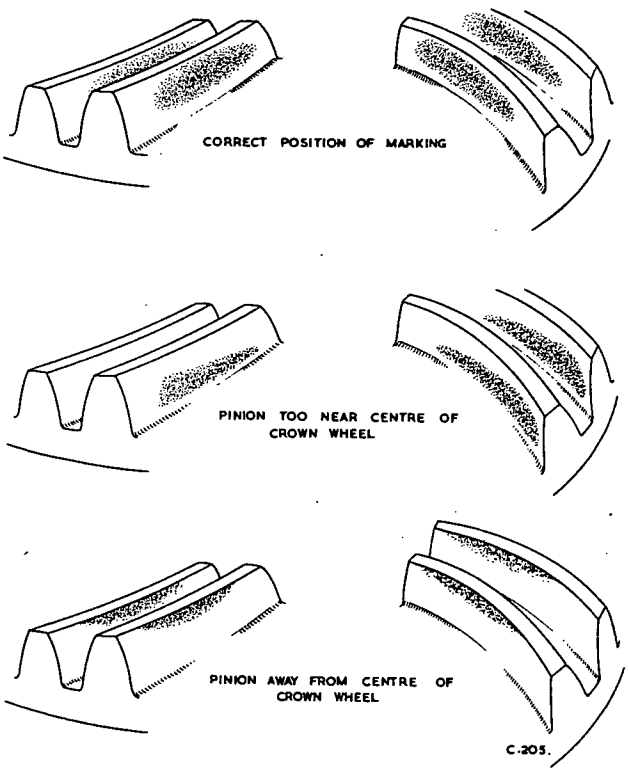


Fig. 165. Diagram of tooth contact

Fit the lockplates to the locking rings, wire lock the bearings cap nuts and fit split pins to the crown wheel mounting bolts. One at a time fit tabwashers to the five nuts of the bearing housing and lock.

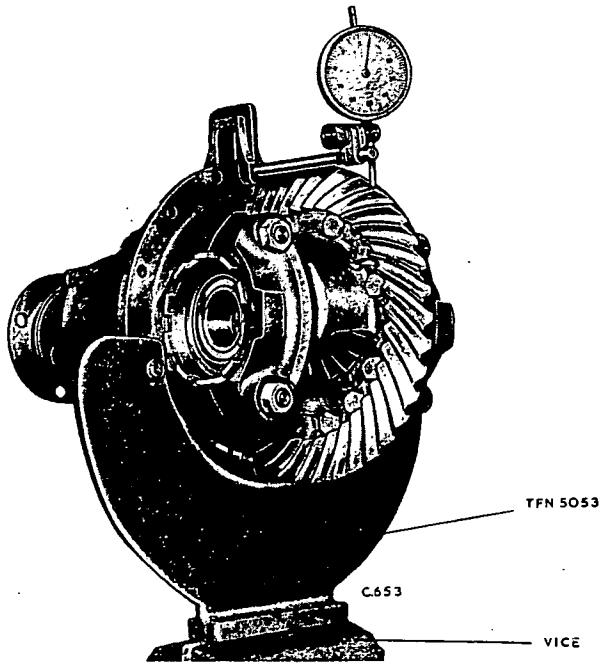
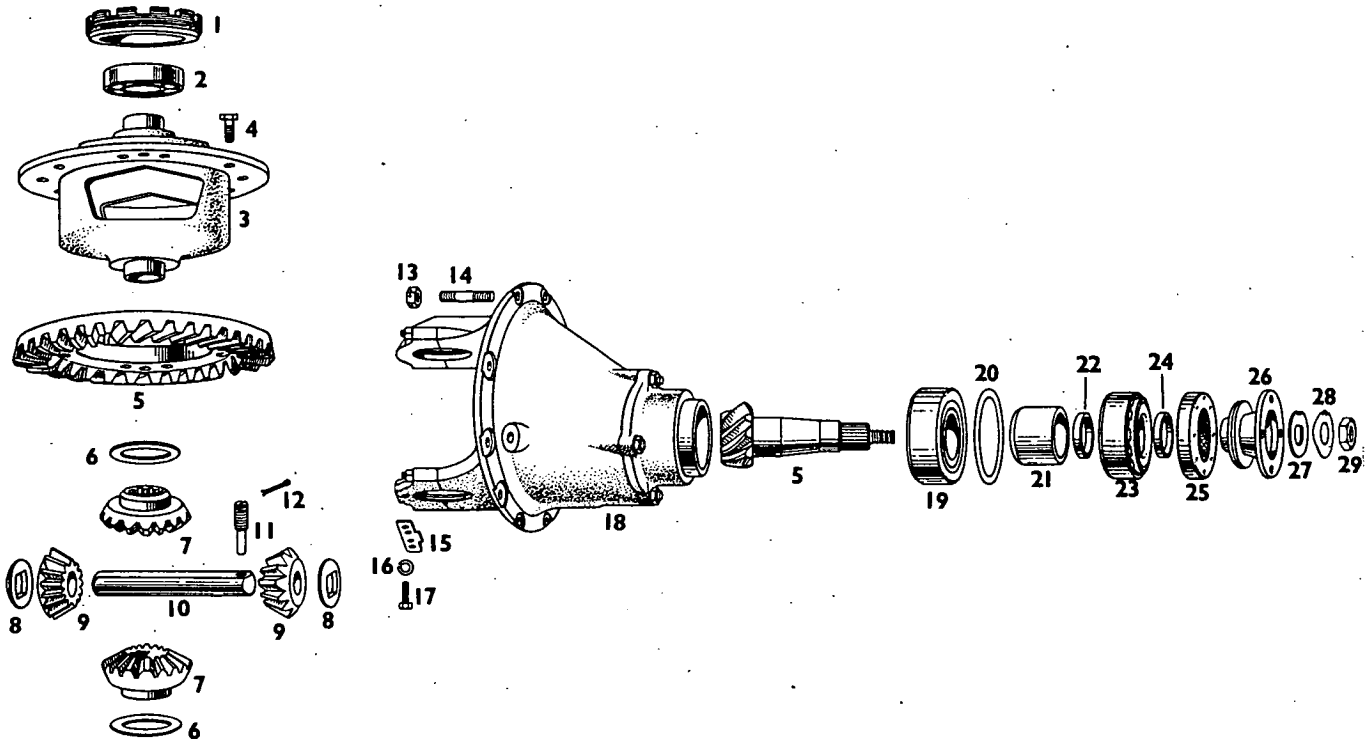


Fig. 166. Checking crown wheel backlash

DIFFERENTIAL GEAR UNIT - FIXED BEARING HOUSING. SERIAL 405-1-30071.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.490271	1	Locking Ring	2	405-1-30032	19	Taper Roller Bearing	1
N.490361	2	Roller Bearing	2	405-1-30040-1		Shim .002 thickness	selec-
405-1-30073-1	3	Crown Wheel Mounting	1	405-1-30040-2		Shim .004 thickness	tive
405-1-30078	4	Attachment Bolt	12	405-1-30040-3	20	Shim .008 thickness	
405-1-30075-1	5	Driving Pinion)	1	405-1-30040-4		Shim .012 thickness	selec-
405-1-30075-2		Crown Wheel) Paired	1	405-1-30040-5		Shim .015 thickness	tive
N.490141-1		Thrust Washer .102 thickness		405-1-30038-1		Distance Piece 1.466 long	1
N.490141-2		Thrust Washer .104 thickness		405-1-30038-2	21	Distance Piece 1.486 long	selec-
N.490141-2A		Thrust Washer .107 thickness		405-1-30038-3		Distance Piece 1.506 long	tive
N.490141-2B		Thrust Washer .105 thickness		405-1-30038-4		Distance Piece 1/526 long	
N.490141-3		Thrust Washer .110 thickness		405-1-30045-1		Distance Washer .200 thickness	
N.490141-4		Thrust Washer .112 thickness		405-1-30045-2		Distance Washer .202 thickness	
N.490141-5	6	Thrust Washer .114 thickness	2	405-1-30045-3		Distance Washer .204 thickness	
N.490141-6		Thrust Washer .116 thickness	selec-	405-1-30045-4	22	Distance Washer .206 thickness	
N.490141-7		Thrust Washer .125 thickness	tive	405-1-30045-5		Distance Washer .208 thickness	
N.490141-8		Thrust Washer .130 thickness		405-1-30045-6		Distance Washer .210 thickness	
N.490141-9		Thrust Washer .118 thickness		405-1-30045-7		Distance Washer .212 thickness	
N.490141-10		Thrust Washer .120 thickness		405-1-30045-8		Distance Washer .214 thickness	
N.490141-11		Thrust Washer .122 thickness		405-1-30045-9		Distance Washer .216 thickness	
N.490051	7	Bevel Gear	2	405-1-30045-10		Distance Washer .218 thickness	1
N.490171-1		Spherical Thrust Washer .219 thickness		405-1-30045-11		Distance Washer .220 thickness	selec-
N.490171-2		Spherical Thrust Washer .221 thickness	2	405-1-30045-12		Distance Washer .209 thickness	tive
N.490171-3		Spherical Thrust Washer .228 thickness	selec-	405-1-30045-13		Distance Washer .211 thickness	
N.490171-4		Spherical Thrust Washer .213 thickness	tive	405-1-30045-14		Distance Washer .213 thickness	
N.490171-5		Spherical Thrust Washer .234 thickness		405-1-30045-15		Distance Washer .215 thickness	
N.490061	9	Bevel Pinion	2	405-1-30045-16		Distance Washer .217 thickness	
N.490471	10	Gear Spindle	1	405-1-30045-17		Distance Washer .219 thickness	
N.490161	11	Lock Pin	1	405-1-30045-18		Distance Washer .221 thickness	
-	12	Split Pin 1/16" dia. ½" long	1	405-1-30033	23	Taper Roller Bearing	1
N.490481	13	Special Nut	4	405-1-30041	24	Distance Washer	1
N.490261	14	Bearing Cap Attachment Stud	4	405-1-30072	25	Oil Seal	1
N.490131	15	Locking Plate	2	N.721013	26	Companion Flange & Dust Seal	1
-	16	Spring Washer 2BA	2	N.490201	27	Special Washer	1
-	17	Setscrew 2BA Hex. Hd. ½" long	2	N.490251	28	Tabwasher	1
405-1-30068	18	Differential Gear Housing	1	FN.212/K	29	Thin Nut ¾" BSF	1



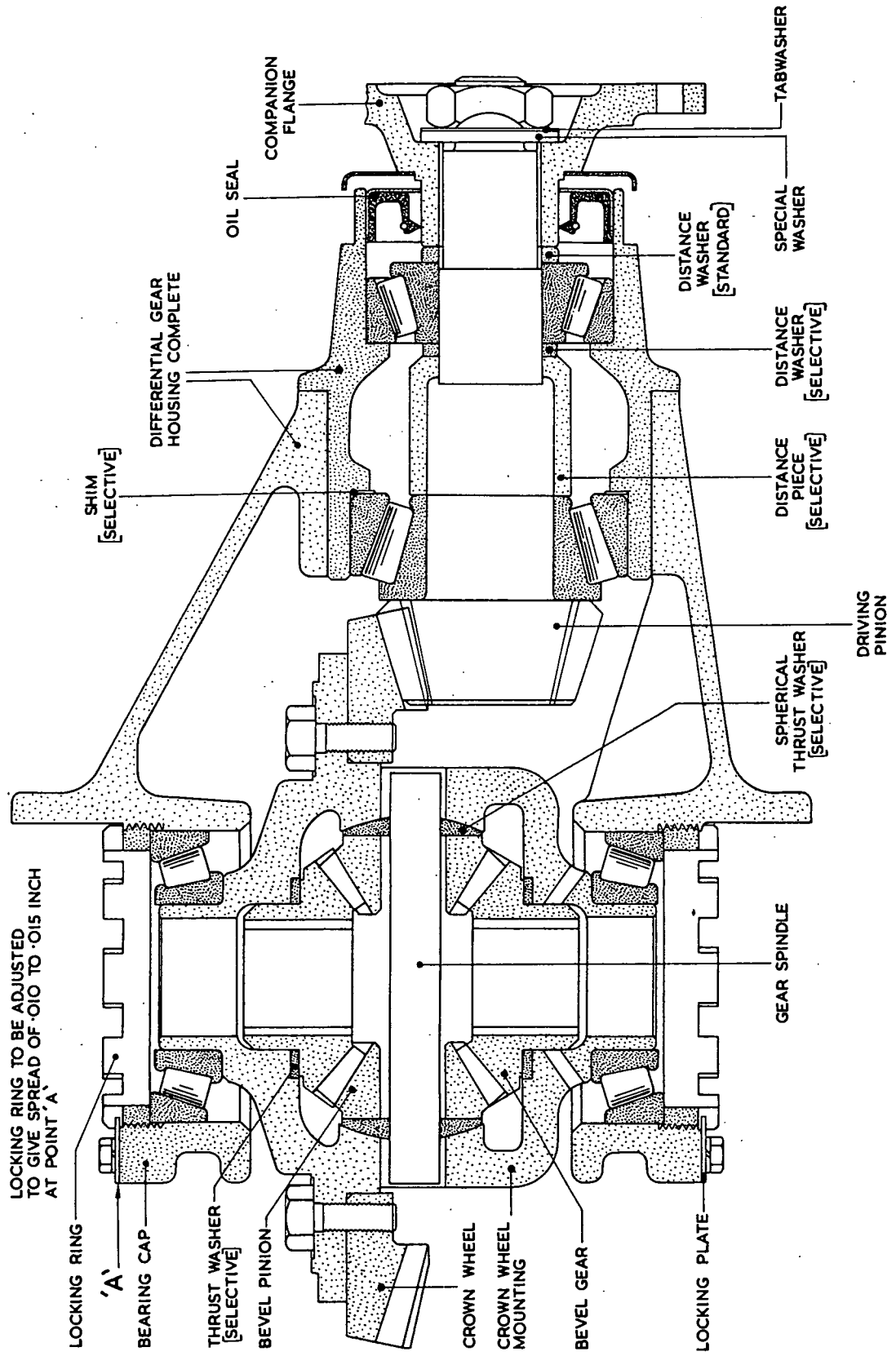


Fig. 167. Assembly of differential unit (Fixed bearing housing)

Dismantling the Unit (Fixed Bearing Housing)

This procedure applies only to Differentials marked with the Part number 405-1-30071. The pinion bearing housing of this unit is shrunk into the differential casing and is not removable.

With the unit removed from the car refer to Fig.167 and proceed to dismantle as follows:-

Locate and bolt the complete assembly on to Vice Plate TFN5053.

Unlock the tabwasher and remove the nut tabwasher and special washer from the companion flange.

Remove the locking plates from both bearing caps and remove the locking wire from the bearing cap nuts. Remove the nuts, bearing caps and the locking rings and lift out the crown wheel mounting complete.

Supporting the casing press out the driving pinion. The bearing inner race and rollers and the selective distance piece and distance washer will remain on the pinion. Take out the standard distance piece between the roller race and the oil seal. Remove the oil seal and take away the inner race and rollers of the front bearing.

If the roller bearings are to be replaced it will be necessary to remove both the outer races from the differential casing and the inner race from the pinion using the following method.

Support the differential casing and press out the larger outer race using spigot TFN5061. Carefully retain the shim or shims between the face of the outer race and its locating shoulder in the housing, this is the basis of the pinion setting. Reverse the casing and press out the smaller outer race using spigot TFN5060.

Proceed to dismantle the crown wheel mounting:-

If the taper rollers are unserviceable, remove them from the crown wheel mounting spigot with extractor tool TFN5057 see Fig.159.

Remove the locking tabs or alternatively the wire locking from the crown wheel bolts and remove the crown wheel. Remove the split pin retaining the pinion spindle lock pin and unscrew the pin. Drift out the bevel pinion spindle.

Remove each pinion together with its spherical thrust washer and keep them together noting the location. Remove the bevel gears.

Phosphor bronze thrust washers are pressed into a recess in the bevel gear location. These are a selective assembly and should only be removed if replacements are necessary. Small holes are provided to enable them to be tapped out but the holes are only accessible when the roller bearings have been removed.

Re-assembling the Unit

Assuming that the roller races and or crown wheel and pinion have to be replaced it will mean that the thickness of shims behind the large bearing outer cone have to be determined and also the distance piece and washer to provide the correct pre-load on the pinion. Proceed to assemble as follows using Fig.167.

If the same pinion is being re-assembled, press into position the larger bearing outer cone with its removed shim or shims. If the pinion is being replaced press in the bearing outer cone without any shims. Press into position the smaller bearing outer cone.

Measure with a micrometer the width across the tooth portion of the pinion (which is 1.125 or 1.300 inch nominal) and make a recording of the actual dimension.

Next press the inner cage of the larger roller bearing into position on the pinion ensuring that it is hard against the back face of the pinion. Read the figures on the face of the pinion which, for example, could read +5 which means +.005 inch on the nominal setting figure of 4.080 see Fig.168. With the differential casing supported vertically locate the pinion into position on the inner roller bearing. With an accurate bar located against the inner diameter of the crown wheel mounting roller race diameters measure accurately the distance between the face of the pinion and the face of the bar. This dimension will now give the thickness of shims required behind the inner roller race.

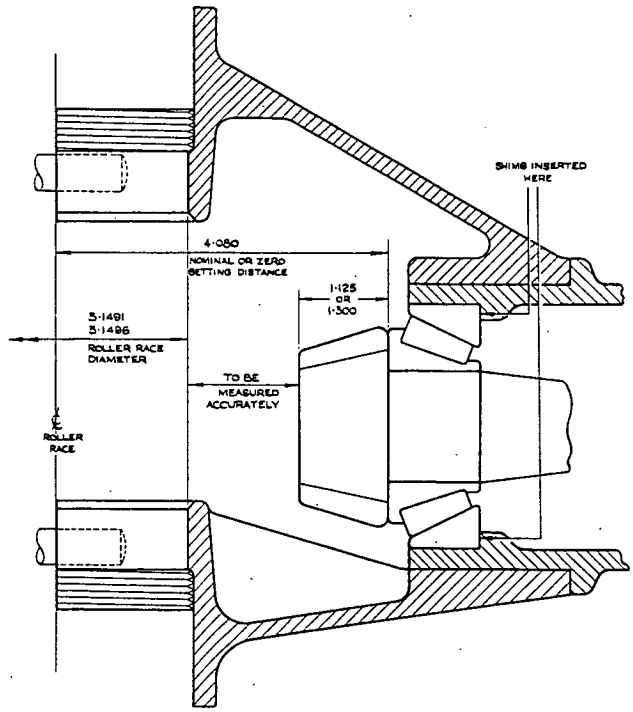


Fig. 168. Pinion setting diagram

Example.

Pinion thickness	1.300
Roller Race diameter = 3.150 / 2 + 3.150 / 2	1.575
Dimension between bar and face of pinion	1.217
Total	4.092
Zero or Nominal Setting ..... Subtract	4.080
Thickness of Shims	0.012

From this stage remove the pinion and press out the larger bearing cone. Select a shim or shims from the five selective thicknesses (Example .012 inch), locate the shim or shims against the shoulder of the bearing housing and press the bearing outer cone again into position.

Fit the distance piece and distance washer to the pinion and position this assembly into the housing. Supporting the face of the pinion press the inner race of the roller bearing into position. Fit the standard distance washer, the companion flange and washer and fit the nut and tighten. If the assembly locks solid the distance piece and/or distance washer is too short. Conversely should the pinion revolve freely check the end float to determine the reduction to make to the distance piece or washer.

By trial and error and the process of pressing the pinion on and off the roller bearing select the correct distance pieces until a torque load of 8-10 lbs/ins has been determined, using a torque spanner or spring balance.

Remove the companion flange and fit the oil seal, lip inwards, with the face of the seal level with the face of the bearing housing. Refit the companion flange, special washer, tabwasher and nut and tighten and lock.

Re-assembling the Crown Wheel Mounting

Make sure that all components are clean and that all oil passages are clear. For assembly use the following procedure referring to Fig.157.

If the two phosphor bronze washers in the crown wheel mounting have not been discarded leave them in position pending the end float check. If they are to be discarded fit two new washers slightly thicker than those taken out. Refer to the Spares illustrations and lists for sizes available.

Preferably support the crown wheel mounting using Vice Plate TFN5056 and then insert the bevel gears.

If the phosphor bronze spherical thrust washers have not been discarded, fit them, together with the bevel pinions. Refer to the Spares Illustrations and lists for the sizes of spherical thrust washers available. With the bevel pinion fitted, insert the spindle, aligning the hole with the locking pin position.

Using the key TFN5064 as shown in Fig.163 make sure that the pinions and gears are free to rotate, then check that each pinion and gear is free to rotate but without end float. Fig.164. If necessary correct by selecting suitable thrust washers. When this is satisfactory, fit the locking pin and lock with the split pin.

Remove the assembly from the Vice Plate and fit the Crown Wheel. The centre punch mark on the crown wheel must line up with the notch on the rim of the mounting.

On certain differentials fit the bolts and nuts and tighten evenly then fit the split pins.

On later differentials the crown wheel has threaded holes and setscrews are inserted from the rear. Tighten these setscrews to a torque loading of 250-300 lb./in. Should lockwashers be fitted to the head of the setscrews discard them and use wire locking as shown in Fig.157. Undrilled setscrew heads should be drilled 3/32 dia.

If the taper roller races have been rejected and removed, press the inner races of the new bearings on to the mounting spigots with the smaller diameter outwards.

Final Assembly Stage of the Differential Unit

The rear ball joint must be fitted to the differential casing, see Rear Suspension, before fitting the crown wheel mounting.

Support the differential casing using Vice Plate TFN5053. Fit the outer races to the roller bearings and fit the crown wheel mounting assembly to the differential casing. Fit the threaded locking rings, fit the bearing caps and making sure that the locking rings can be moved freely in the threads screw up the bearing cap nuts to a torque figure of 28 lb.ft.

Measure the differential casing across point 'A' Fig.167 while the locking rings are free and record this dimension. Using a dial indicator set the locking rings to give a backlash on the crown wheel, as shown on Fig.166, if not more than .004 to .006 inch. When this is satisfactory further tighten each locking ring until a 'spread' of .010 to .015 inch is obtained across point 'A'. Again check the backlash and if correct within the limits fit the locking plates to the serrations in the locking rings.

A final marking check can be taken, see Fig.165, but providing the correct setting of the pinion has been carefully carried out and the correct backlash adjusted then the positions of the gears should be correct and the unit should be satisfactory when fitted to the car.

Propellor Shaft

List of Contents

Propellor Shaft

Propellor Shaft

Type

404 Car.....Hardy Spicer KR1308/GB44

405 Car.....Hardy Spicer KR1300

See Fig.169.

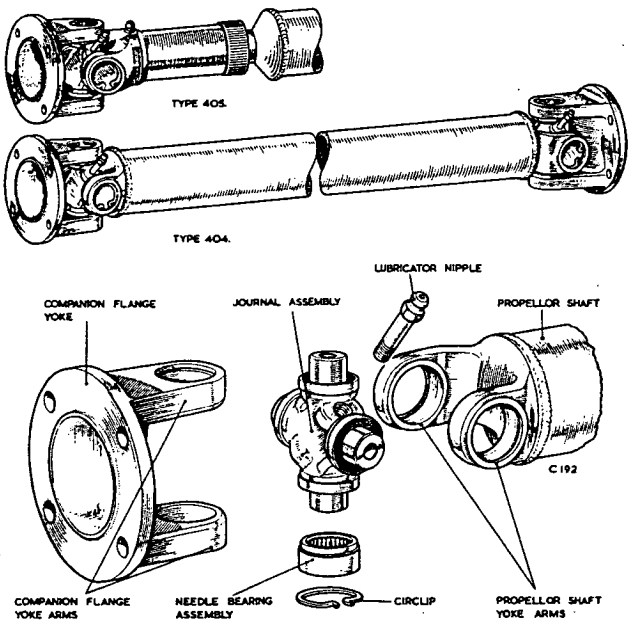


Fig. 169. General assembly of propellor shafts

The former shaft is a fixed length, any fore and aft movement being taken up by the extension shaft in the rear of the gearbox.

The latter shaft has a splined sliding portion embodied into the shaft.

Replacements

Serviced exchange propellor shafts are available from the manufacturers or their agents or from the manufacturers of the car.

Removing the Shaft from the Car

Working from beneath the car remove the four bolts in the flanges at either end of the shaft.

Holding the shaft firmly and using the sliding shafts to advantage disconnect the shaft from its registers on the companion flanges.

Refitting the Shaft to the Car

Type 404 Cars.

(a) Wipe the companion flange and flange yoke faces clean to ensure the pilot flange registering evenly all round.

(b) Attach the rear end to the differential companion flange, insert the bolts, tighten the nuts evenly and split pin.

(c) Slide the extension shaft, in the gearbox, to engage the other end of the shaft and bolt evenly and securely.

Type 405 Cars.

Proceed as the foregoing (a) then:-

(b) Attach the longest of the sliding portions to the differential companion flange, tighten the bolts evenly and insert the split pins.

(c) Slide the front portion forward to engage the companion flange of the overdrive unit and bolt evenly and securely.

To Dismantle the Ends of the Shaft

If necessary the two portions of the sliding shaft can be separated by unscrewing the serrated dust cap.

Clean any enamel from snap rings and the top of the bearing races. Remove all snap rings by pinching the ears together with a pair of pliers, and prising with a screwdriver. If ring does not snap out of groove readily tap end of face lightly to relieve the pressure against ring. Support the shaft and with the yoke lug on top, tap yoke arms lightly with a soft hammer. Fig.170.

Top bearing should begin to emerge. turn shaft over and finally remove with fingers. Fig.171.

If necessary tap bearing race from inside with small diameter bar, taking care not to damage bearing race Fig.172.

Keep joint in this position so as to avoid dropping the needle rollers. Repeat this operation for opposite bearing. The flange yoke can now be removed Fig.173. Rest the two exposed trunnions on wood or lead blocks, then tap yoke with soft hammer to remove the two remaining bearing races. Wash all parts in petrol.

Examine and Check for Wear

The parts most likely to show signs of wear after long usage are bearing races and spider journals. Should looseness in the fit of these parts, load markings or distortion be observed, they should be renewed complete as a unit, ie. because worn needle bearings used with a new spider journal, or new needle bearings used with a worn spider journal, will wear more rapidly making another replacement necessary in a short time.

It is essential that bearing races are a light drive fit in the yoke trunnion.

In the rare event of wear having taken place in the yoke cross holes, only in cases of emergency should these be re-assembled. They should normally be replaced by a complete assembly.

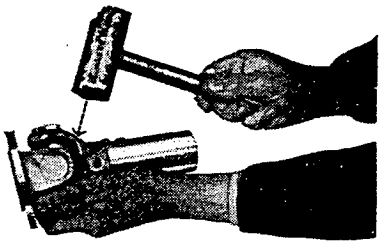


Fig. 170. Releasing the needle bearings

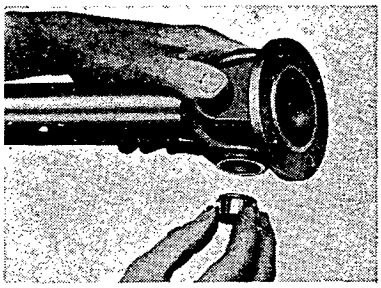


Fig. 171. Removing the needle bearings

Re-assembly of the Shaft

Insert journal in yoke holes and using a soft round drift with flat face about 1/32 inch smaller in diameter than the hole in the yoke, tap the bearing into position. Repeat this operation for the other bearing locations and replace the snap rings.

If the joint appears to bind tap lightly with a wooden mallet, which will relieve any pressure of the bearings on the end of the journal.

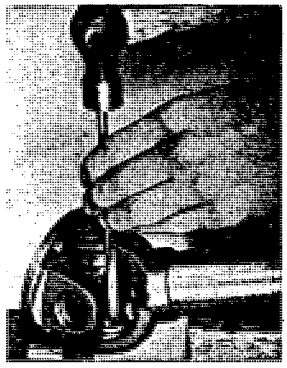


Fig. 172. Removing tight needle bearings

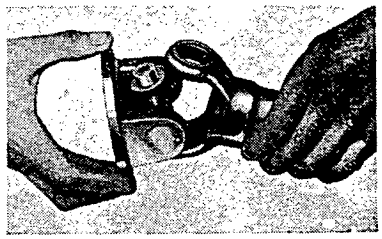


Fig. 173. Disconnecting the flange yoke

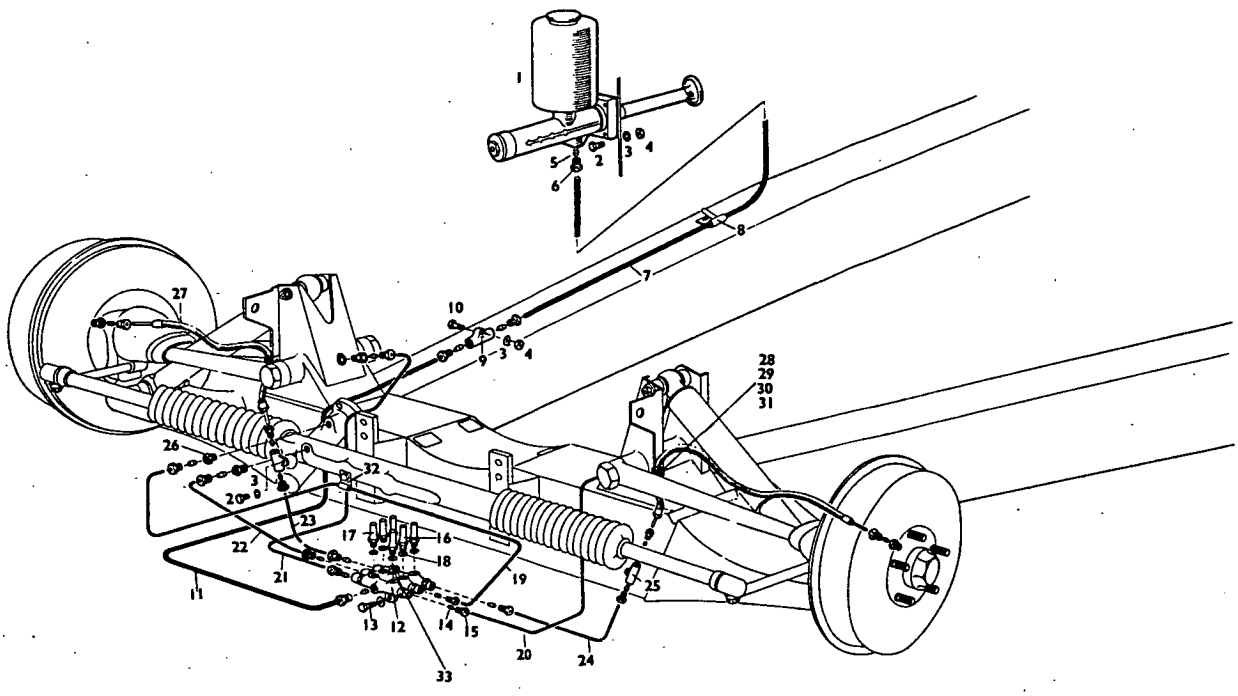
Lubrication 'One Shot' System

List of Contents

Lubrication 'One Shot' System

LUBRICATION SYSTEM - ONE SHOT

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-26012	1	Pump & Tank Unit. Enots LV276	1	N.530331	18	Washer Enots LT 80	6
FB.104/9D	2	Bolt ¼" BSF 1.1/8" long	6	404-1-26005	19	Pipe - Rigid - Centre RHD	1
ND	3	Washer ¼" Shakeproof	7	404-1-46005	-	Pipe - Rigid - Centre LHD	-
FN.104/K	4	Nut ¼" BSF	4	404-1-26003	20	Pipe - Rigid - LH - Front	1
N.530191	5	Tubing Sleeve 5/16" Enots Z4	4	404-1-26004	21	Pipe - Rigid - RH - Front	1
N.530201	6	Tubing Nut 5/16" Enots Z18	4	404-1-26006	22	Pipe - Rigid - to Steering Rack RHD	1
N.530021	7	Main Delivery Pipe - Rear RHD	1	404-1-46006	-	Pipe - Rigid - to Steering Rack LHD	1
404-1-26011	-	Main Delivery Pipe - Rear LHD	-	404-1-26008	23	Pipe - Rigid RH - Rear	1
N.530291	8	Trimount Fastener	1	404-1-26007	24	Pipe - Rigid LH - Rear	1
N.530301	9	Bracketed Connector Enots Y16	1	N.530261	25	Bracketed Connector Enots Y19	2
FB.104/10D	10	Bolt ¼" BSF 1¼" long	1	N.530281	26	Male Tube Adaptor	6
404-1-26009	11	Main Delivery Pipe - Front RHD	1	N.530271	27	Flexible Delivery Pipe	2
404-1-46009	-	Main Delivery Pipe - Front LHD	-	Lucas 187052	28	Cleat (Use with 3/8"dia. pipe)	2
404-1-26001	12	Distributor Enots LY 926	1	Lucas 187079	-	Cleat (Use with 7/16"dia. pipe)	2
FB.104/5D	13	Bolt ¼" BSF 5/8" long	1	-	29	Setscrew 2BA 3/8"long	2
N.530241	14	Tubing Sleeve 3/16" Enots Z2	14	-	30	Washer 2BA Shakeproof	2
N.530251	15	Tubing Nut 3/16" Enots Z24	14	-	31	Nut 2BA	2
N.530231	16	Air Chamber Enots LW3	1	N.530341	32	Clip	1
405-1-26010	17	Air Chamber Enots LW11	5	404-1-26010	33	Plug - Enots LW 9	1



Lubrication 'One Shot' System

Description

This system Fig174provides for the lubrication of the front stub axle swivel pins and bushes, the steering box, the steering tie tube ball joints, the top and bottom pins and the bearings of the front suspension radius arms.

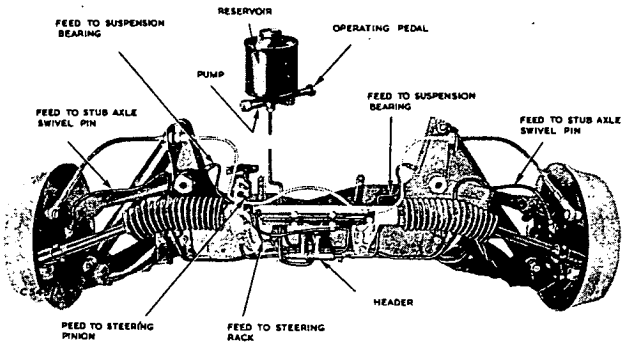


Fig. 174. One-shot lubrication system

A foot operated plunger is situated inside the car above the accelerator pedal.

The system comprises an oil tank connected via a non-return valve to a piston type pump, the spring loaded pump shaft forming the operating plunger. The pump and tank unit is bolted to the bulkhead and is connected by a pipe line to the central union of a header situated on the forward face of the front suspension assembly.

The header consists of a bronze body containing six spring loaded double acting valves and air chambers which control the amount of oil passed to the particular component.

Operation

At reasonable regular intervals the plunger should be pumped with the foot until resistance is felt and then release it. Do not attempt to force the pump beyond this resistance as this can result in a burst front seal which would then have to be replaced.

Servicing

Replacement exchange pump and tank units are available from the manufacturers of the car. Spares are also available from the car manufacturers or from the makers of the system Messrs. Benton & Stone, Aston Brook Street, Birmingham 6.

To remove the pump, drain the tank and pump unit by detaching the union nut of the pipe connection on the underside of the pump body and catch the oil in a clean container. Then remove the four 1/4" BSF. Bolts attaching the unit to the bulkhead.

The Pump and Tank Unit detail parts and the header details are shown in Fig.175and Fig. 176 All pipe connections are made with a tubing sleeve and tubing nut and they can be freely disconnected for checking the oil feed to any given point.

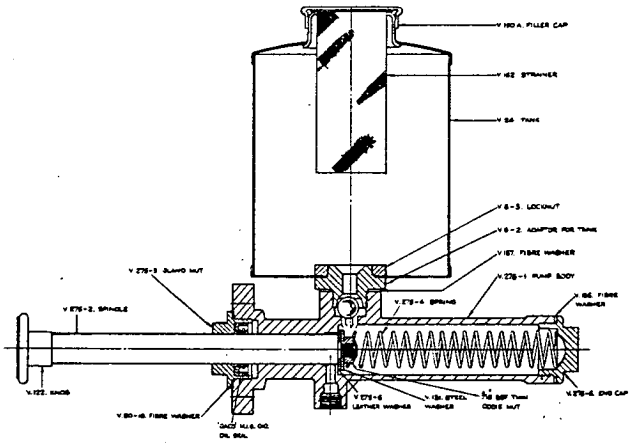


Fig. 175. Pump and tank unit

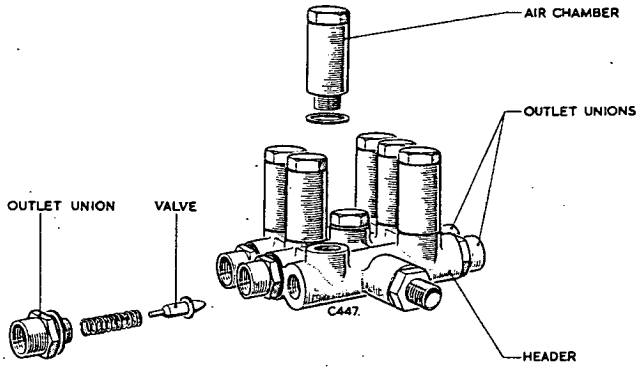


Fig. 176. Header unit

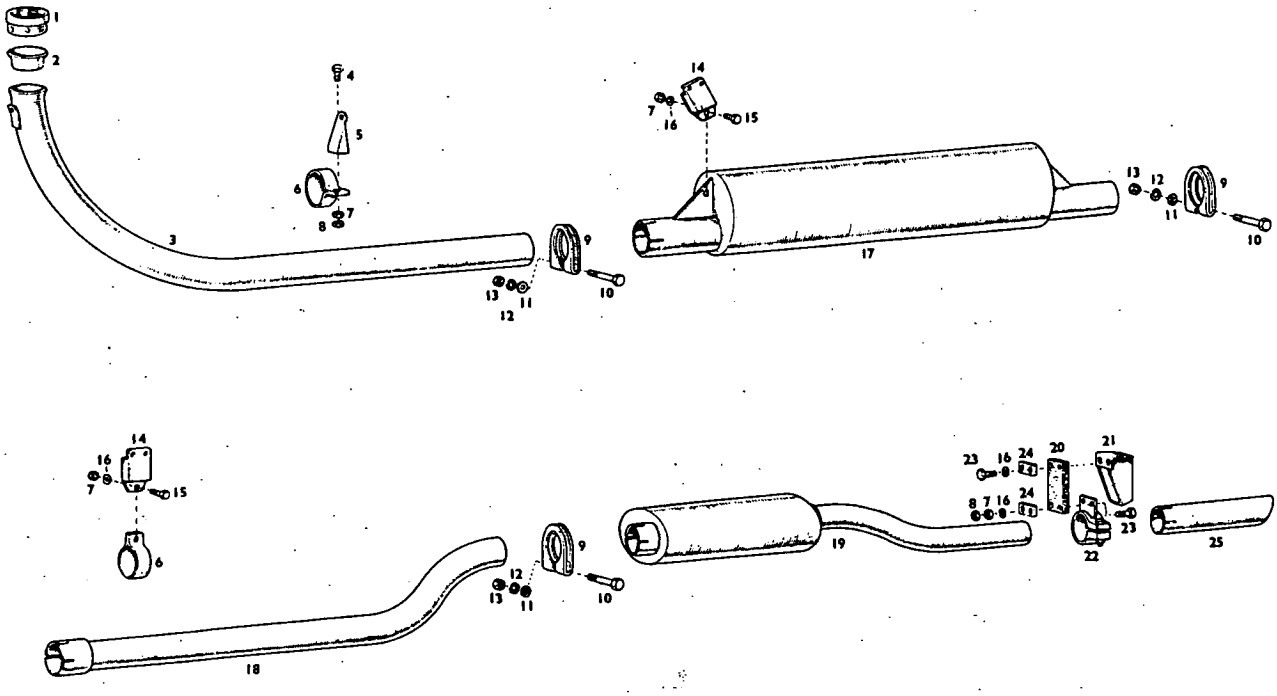
Exhaust System

List of Contents

Exhaust System

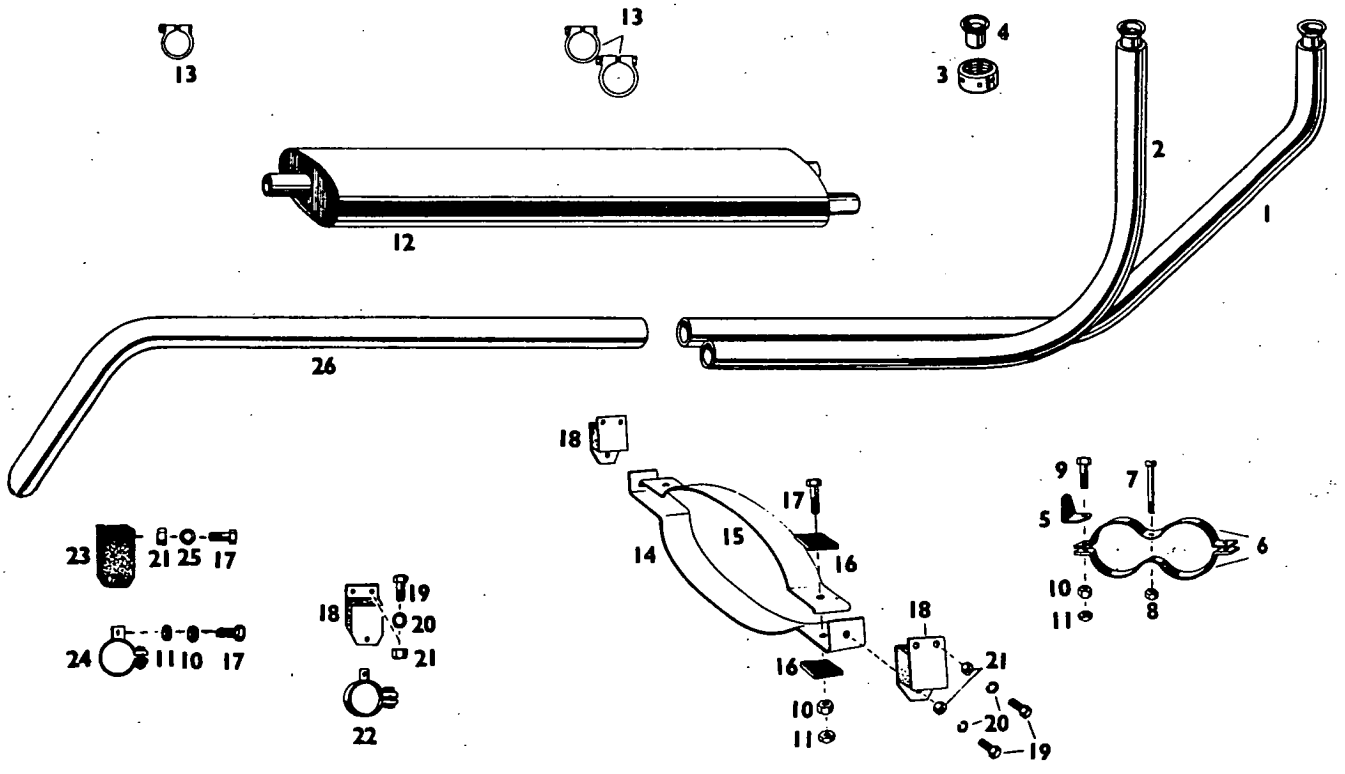
TYPE 404. EXHAUST SYSTEM.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-29003	1	Ring Nut	1	N.510631	14	Flexible Mounting	2
404-1-29007	2	Socket	1	FS104/4D	15	Setscrew ¼" BSF - ½" long	2
404-1-29006	3	Exhaust Down Pipe	1	AGS.585/D	16	Spring Washer ¼"	2
FB.104/6D	4	Bolt ¼" BSF ¾" long	1	404-1-29016	17	Main Silencer	1
404-1-29009	5	Bracket - Exhaust Down Pipe	1	404-1-29028	18	Intermediary Pipe	1
404-1-29010	6	Pipe Clip - Exhaust	1	404-II-29040	19	Tail Silencer	1
-	7	Nut ¼" BSF - Brass	6	404-II-29035	20	Exhaust Mounting Rubber	1
-	8	Locknut ¼" BSF - Brass	5	404-II-29034	21	Mounting Bracket - Tail Pipe	1
N.510591	9	Pipe Clip	3	404-II-29036	22	Pipe Clip - Rear	1
FB105/28D	10	Bolt 5/16" BSF 3½" long	3	FB.104/8D	23	Bolt ¼" BSF 1" long	4
-	11	Washer 5/16" Plain	3	404-II-29037	24	Clamping Plate	2
AGS.585/E	12	Spring Washer 5/16"	3	404-II-29039	25	Chromed Sleeve	1
-	13	Nut 5/16" BSF - Brass	3				



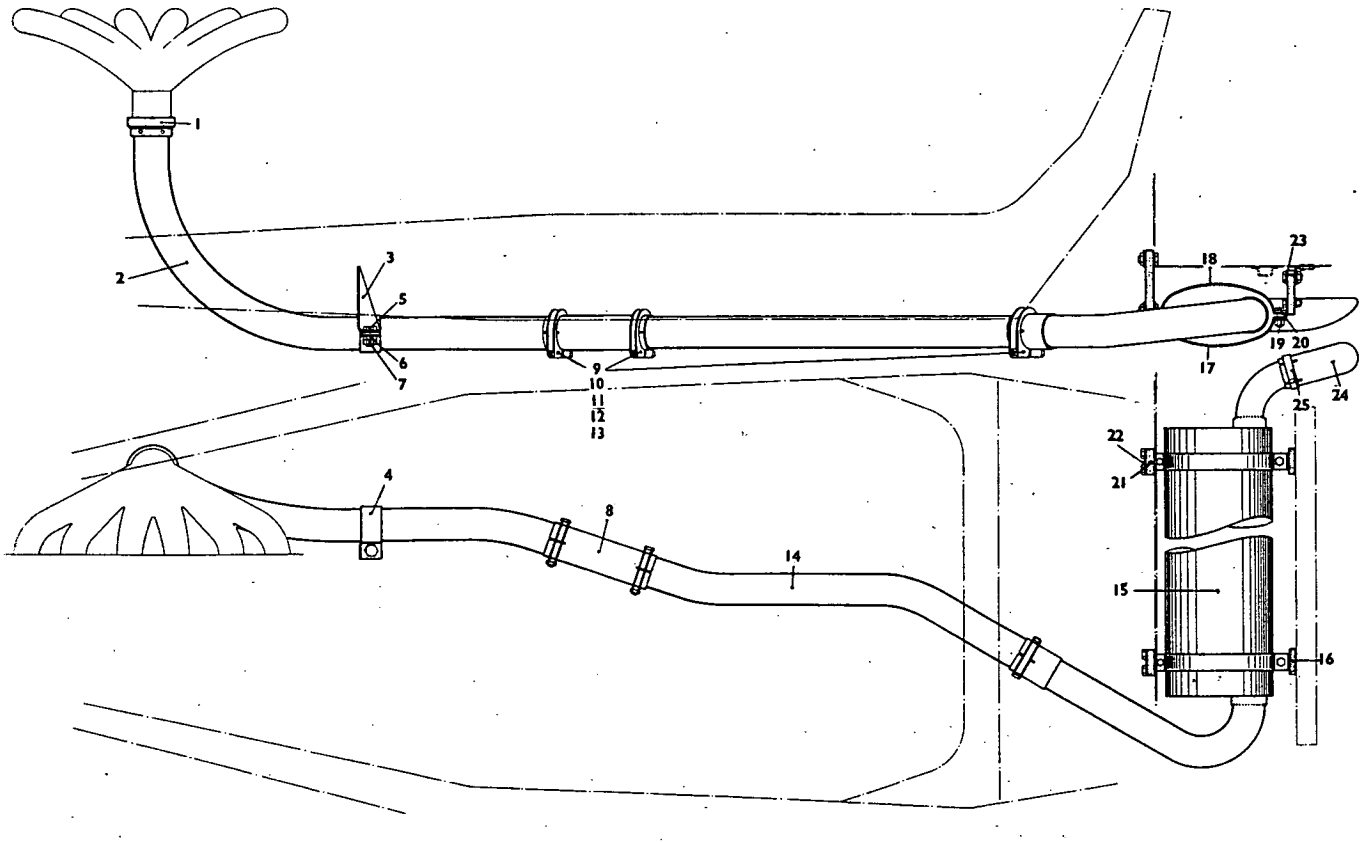
TYPE 405. EXHAUST SYSTEM.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
405-1-29013	1	Exhaust Down Pipe - Front	1	N.716061	14	Silencer Clip - Bottom Half	1
405-1-29014	2	Exhaust Down Pipe - Rear	1	N.716062	15	Silencer Clip - Top Half	1
N.510171	3	Ring Nut	2	N.716068	16	Reinforcing Plate	4
N.510591	4	Socket	2	FB104/8D	17	Bolt ¼" BSF x 1" long	5
N.716087	5	Lug	1	N.510631	18	Flexible Mounting	3
N.716059	6	Clip	2	FB.104/4D	19	Bolt ¼" BSF x ½" long	9
-	7	Bolt 2BA Cheese Hd. 1½" long	1	-	20	Spring Washer ¼" dia.	9
-	8	Nut 2BA Brass	1	FN104/K	21	Nut ¼" BSF	9
FB104/6D	9	Bolt ¼" BSF x ¾" long	2	N.716066	22	Exhaust Pipe Clip complete	1
-	10	Nut ¼" BSF - Brass	4	405-1-29016	23	Exhaust Mounting Rubber	1
-	11	Locknut ¼" BSF - Brass	4	405-1-29024	24	Pipe Clip - Rear - complete	1
N.716058	12	Silencer	1	-	25	Washer ¼" Plain	2
N.716063	13	Pipe Clip - complete	3	405-1-29022	26	Tail Pipe	1



TYPE 405. EXHAUST SYSTEM. DROPHEAD CAR ONLY.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-29003	1	Ring Nut	1	405-1D-29001-3	14	Centre Pipe	1
405-1D-29001-1	2	Down Pipe	1	405-1D-29001-10	15	Exhaust Pipes and Silencer complete	1
405-1D-29001-7	3	Bracket	1				
404-1-29010	4	Pipe Clip	1	405-1-29016	16	Mounting Rubber - short	1
FB.104/6D	5	Bolt	1	405-1D-29001-8	17	Silencer Clip - Bottom	1
-	6	Nut ¼" BSF Brass	17	N.716062	18	Silencer Clip - Top	1
-	7	Locknut ¼" BSF Brass	17	N.716068	19	Reinforcing Plate - Silencer Clip	8
405-1-29001-2	8	Coupling Pipe	1	FB.104/8D	20	Bolt	16
N.510491	9	Pipe Clip	3	405-1D-29001-9	21	Mounting Rubber	2
FB.105/28D	10	Bolt	3	404-II-29037	22	Clamping Plate	2
-	11	Washer 5/16" Plain	3	-	23	Washer ¼" Plain	8
AGS.585/E	12	Spring Washer	3	404-II-29039	24	Chromed Sleeve - Tail Pipe	1
-	13	Nut 5/16" BSF Brass	3	-	25	Jubilee Clip Size 2A	1



Exhaust System

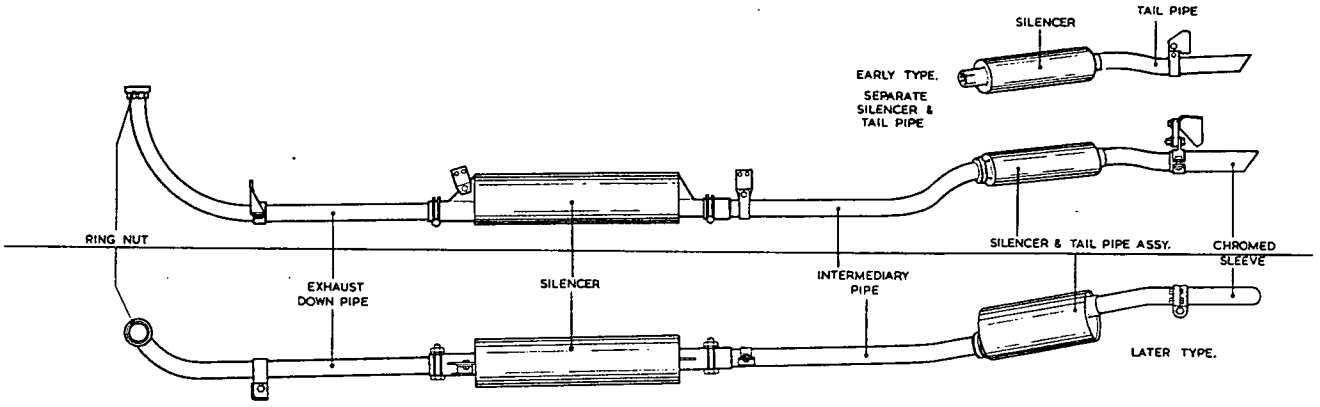
Type 404 Cars

The exhaust system is shown in Fig.177 with its earlier and later type tail silencer. Up to Chassis 2028 the tail silencer was a separate unit, with a separate and combined tail pipe and clip. On and from Chassis 2029 the tail silencer and tail pipe are one unit with a Chromed tail pipe as an additional part. At the same time the attachment of the tail pipe to the chassis was altered.

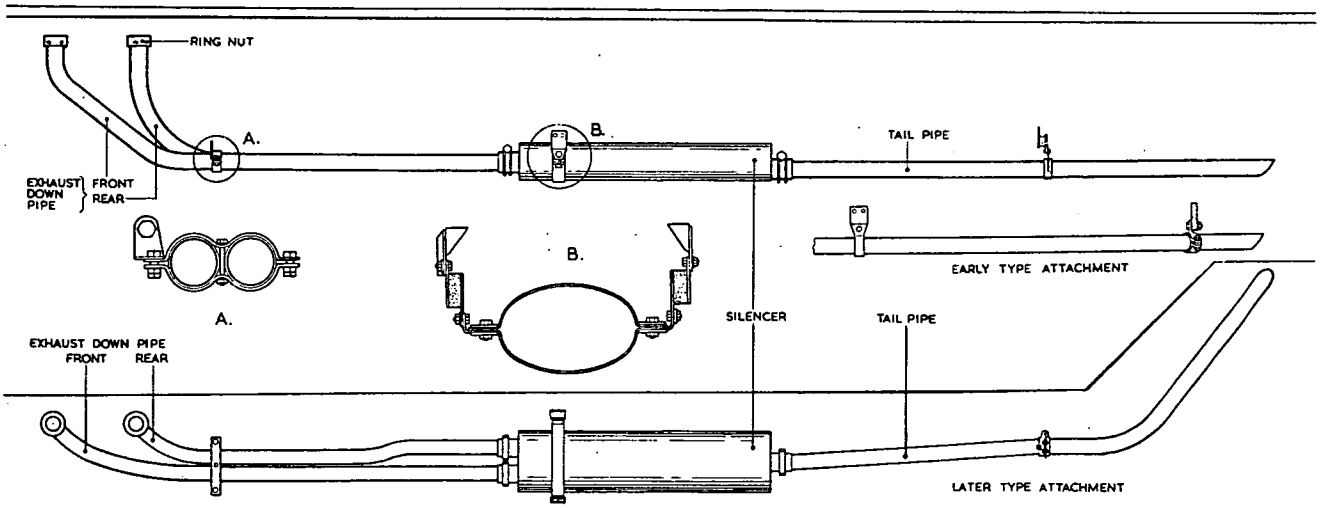
Type 405 Cars

The exhaust system is shown in Fig.177. On very late cars the tail pipe clip and the attachment to the chassis was moved from the boot panel to the rear of the boot to eliminate exhaust vibration.

On all but early cars an exhaust heat shield was fitted between the silencer and the rear right hand floor, while a further heat shield can be fitted to the exhaust



TYPE 404 EXHAUST SYSTEM



TYPE 405 EXHAUST SYSTEM

Fig. 177. Exhaust system. Type 404 and 405 cars

down pipes to special order only. Both types of heat shields are shown in Fig.178.

Type 405 Drophead Cars

This system is shown in the Spare parts illustration of the Exhaust System.

Servicing

There is no gasket or packing used at the joint between the exhaust manifolds and the exhaust down pipes at the ring nut location. The exhaust manifold outlets are spherical and the pipes are spherically bell-mouthed.

In the event of the flange of the down pipes becoming damaged a flanged socket is available as a spare. The top of the pipe with its flange, can therefore be cut completely away and the socket welded into the pipe.

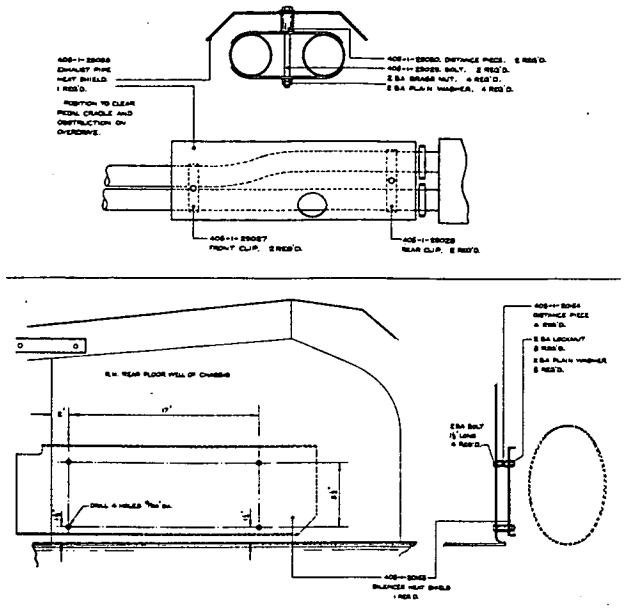


Fig. 178. Exhaust heat shields

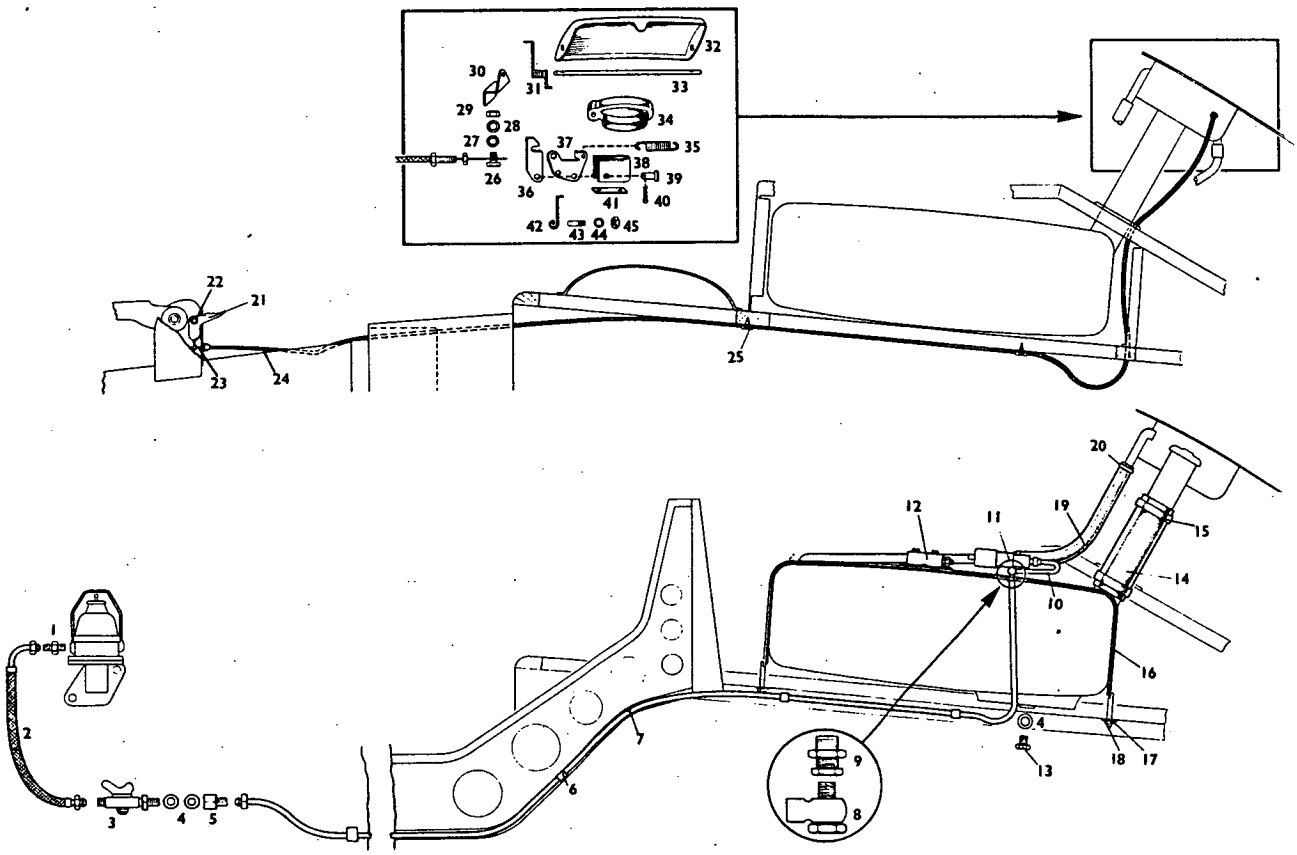
Fuel System

List of Contents

Fuel System

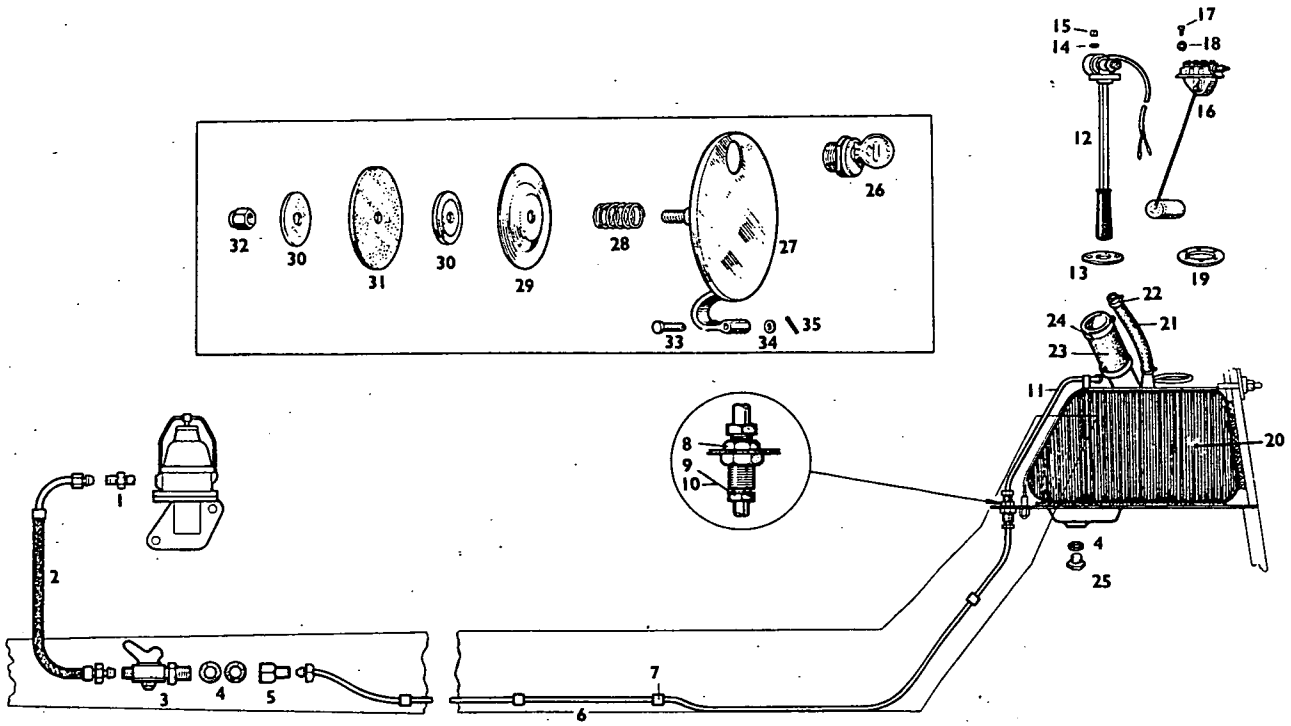
TYPE 404. FUEL SYSTEM.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.520611	1	Union	1	404-1-67014	22	Spacer	2
N.520591	2	Flexible Fuel Pipe	1	404-1-67015	23	Cable complete	1
N.708050	3	Fuel Tap	1	404-1-67017	24	Casing complete	1
N.310510	4	Washer	3	Lucas 187045	25	Clip	2
N.708049	5	Adaptor	1	N.702066	26	Clamp screw	1
N.530291	6	Trimount Fastener	6	N.702065	27	Spacer	1
404-1-33012	7	Main Fuel Feed Pipe	1	-	28	Washer ¼" dia.	1
404-1-33007	8	Banjo Connector complete Enots YAC.119	1	FN.105/L	29	Nut ¼" BSF	1
404-1-33006	9	Bulkhead Connector. Enots Z86	1	N.702074A	30	Hinge Bracket LH	1
404-1-33000-2	10	Fuel Feed Pipe - Rear Used up to Chassis 2013	1	N.702074B	-	Hinge Bracket RH	1
				N.702076A	31	Spring LH	1
404-1-32925-1	-	Fuel Feed Pipe - Rear Used on and from Chassis 2014	1	N.702076B	-	Spring RH	1
				N.702113	32	Filler Door	1
404-1-33011	11	Feed Unit. Used up to Chassis 2013	1	N.702077	33	Hinge Spindle	1
Lucas 78028A	-	Reserve Unit. Used on and from Chassis 2014	1	N.702056	34	Filler Cap	1
Smiths EXY 12667	12	Float Unit Used up to Chassis 2013	1	N.702064	35	Extension Spring	1
				N.702061	36	Catch	1
Smiths Y. 80882/1	-	Float Unit Used on and from Chassis 2014	1	N.702062	37	Operating Plate	1
				N.702063	38	Catch Bracket	1
N.708047	13	Sump Plug	1	SP4/C3	39	Pin	1
-	14	Rubber Hose 2 i/d x 2½" o/d 3 ply 6¾" long	1		40	Split Pin 1/6" dia. 5/16" long	1
N.702089	15	Clip- Jubilee No.3	2	N.702083	41	Packing Block	1
404-1-33010	16	Tank Strap	2	N.702090	42	Catch Spring	1
AGS.947	17	Washer	4	N.702052	43	Spring Clamp Screw	1
-	18	Nut. Simmonds ¼" BSF	4	-	44	Washer ¼" Shakeproof	1
-	19	Rubber Hose ½" i/d x 7/8" o/d x 11" long	1	FN104/L	45	Nut ¼" BSF	1
N.707102-14	20	Clip. Jubilee Size '0'	2				
404-1-67031	21	Lever	1				



TYPE 405. FUEL SYSTEM AND FILLER CAP.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.520611	1	Union	1	N.708030	19	Gasket - Float Unit	1
N.520591	2	Flexible Fuel Pipe	1	405-1-33009	20	Fuel Tank Assy. (not Drop-Head Cars)	1
N.708050	3	Fuel Tap	1	405-1D-33008	-	Fuel Tank Assy. (Drop-Head Cars only)	1
N.310510	4	Washer	3	405-1-33000-4	21	Rubber Hose ½" i/d x ¼" o/d 2 ply 11¼" long	1
N.708049	5	Adaptor	1	N.707102-14	22	Clip - Jubilee Size '0'	2
405-1-33000-1	6	Fuel Pipe - Front	1	405-1-33000-3	23	Rubber Hose 7" i/d x 2½" o/d 3 ply 5.7/8" long	1
N.530291	7	Trimount Fastener	7	N.702089	24	Clip - Jubilee No.3	2
404-1-33006	8	Bulkhead Connector	1	N.708047	25	Sump Plug	1
N.530201	9	Tubing Nut 5/16"	2	405-1-62001-15	26	Latch Lock with 2 Keys	1
N.530191	10	Tubing Sleeve	2	405-1-62005	27	Filler Lid	1
405-1-33000-2	11	Fuel Feed Pipe - Rear	1	405-1-62001-18	28	Spring	1
Lucas 78029A	12	Reserve Unit	1	405-1-62001-19	29	Pressure Plate	1
Lucas	13	Gasket - Reserve Unit	1	AGS 161D	30	Washer	2
-	14	Washer 2BA Shakeproof	2	405-1-62001-20	31	Sealing Rubber	1
-	15	Nut 2BA Brass	2	NPF 084/11/2	32	Nut ¼" BSF Pinnacle	1
Smiths Y86049	16	Float Unit	1	SP4/B/18	33	Hinge Pin	1
-	17	Screw 3BA Round Hd. 9/16" long	6	-	34	Washer 2BA Plain	1
-	18	Washer 3BA Shakeproof	6	-	35	Split Pin 1/16" dia. 3/8 " long	1



Fuel System

Petrol Tank

Type 404 Cars.

The tank is housed beneath the rear luggage shelf where it is secured by two steel straps. It is accessible by removing the luggage shelf. A trap in the rear body panel encloses the tank filler cap Fig.179 and Fig.180 which is released by a trigger at the rear of the handbrake lever Fig.181.

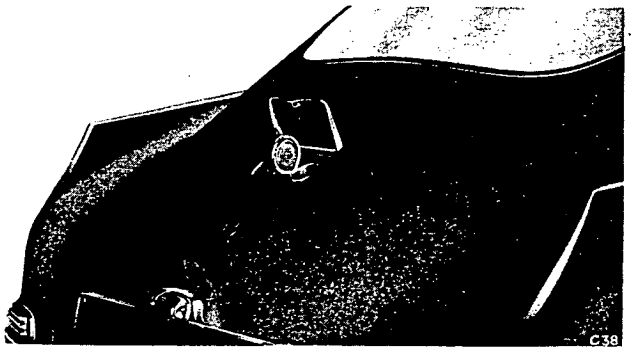


Fig. 179. Filler cap (Type 404)

Type 405 Cars.

The tank is housed behind the rear seat squab and secured by two steel straps. A trap which is locked with an independent key, encloses the filler. Fig.182.

Removing the Float Unit or Reserve Unit

Type 404 Cars.

Disconnect the battery. Release the catches positioning the hinged end of the luggage shelf, then remove the screws securing the shelf to the rear structure and remove the shelf. Fig.183.

Type 405 Cars.

Disconnect the battery. From within the boot, disconnect the electrical cables to the rear speaker. Remove the rear seat squab, detach the squab shelf and manoeuvre the shelf clear. Fig.184. On both cars proceed as follows.

Float Unit

Removing

Disconnect the electrical cables at the unit. Mark the flange and the petrol tank for correct re-assembly and remove the six screws and fibre washers, and withdraw the unit Fig.185. Cover the aperture.

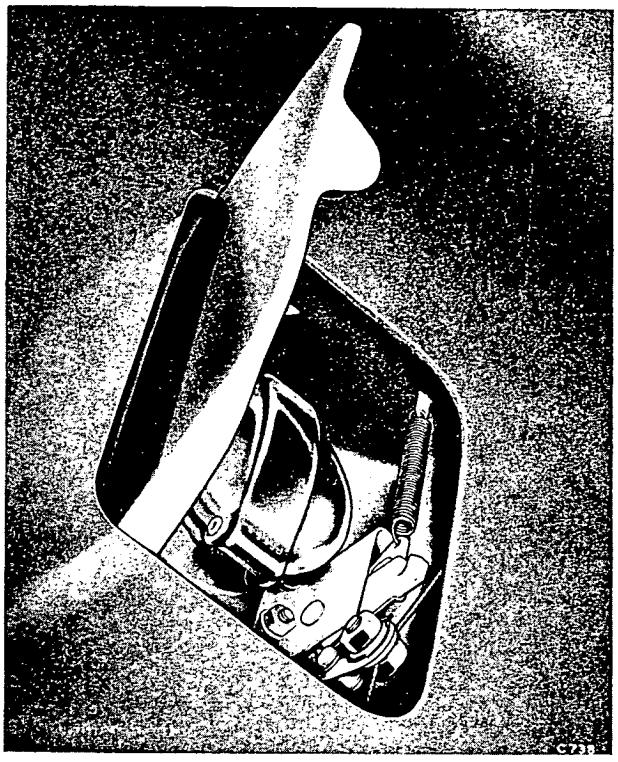


Fig. 180. Filler cap mechanism

Checking

Shake the float, if it is punctured, fuel will have entered the float.

Make sure that the arm is soldered securely to the float.

Attach the electrical connections and secure a good earth wire between the flange of the unit and any free from paint metal part of the tank compartment.

WARNING. Do not use a connecting point near the unit attachment flange of the tank in case a spark occurs and ignites the petrol vapour.

Switch on the ignition and, holding the float unit steady, move the arm through the complete arc of its travel and observe the instrument. The needle of the

gauge should move steadily.

Refitting

Clean off any traces of the joint washer or jointing compound on the flange of the unit or on the tank aperture.

Apply jointing compound to both sides of a new joint washer. Re-assemble the unit to the tank, reversing the procedure for removal.

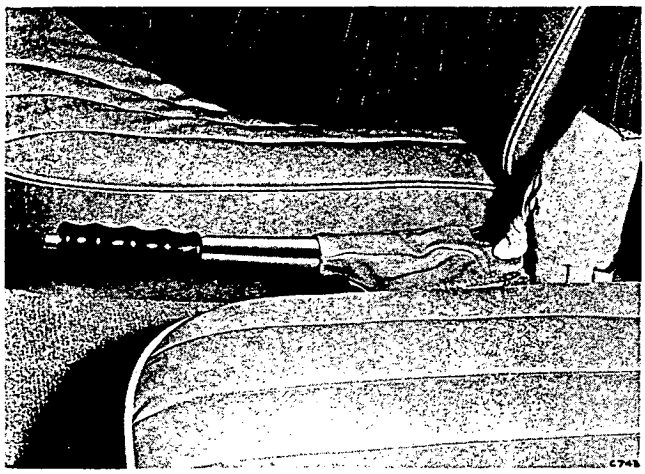


Fig. 181. Releasing petrol filler door

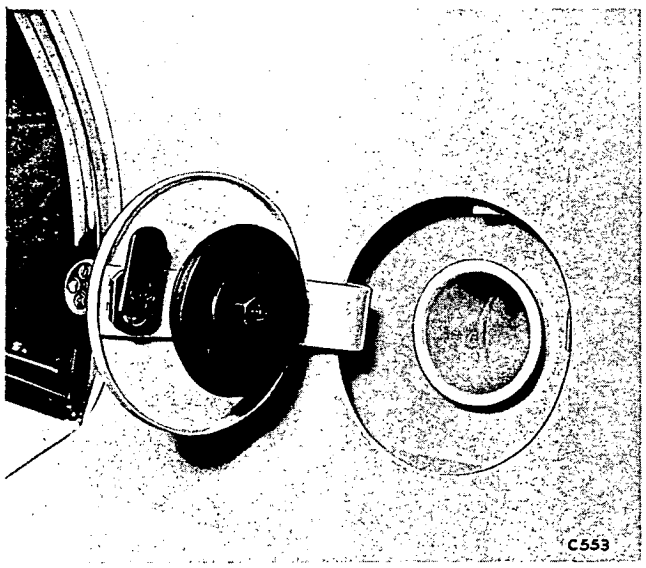


Fig. 182. Filler cap (Type 405)

Petrol Reserve Unit

Removing

Disconnect the electrical connections and disconnect the pipe, remove the two securing screws and the fibre washers and withdraw the unit from the tank. Fig.186. Cover the aperture.

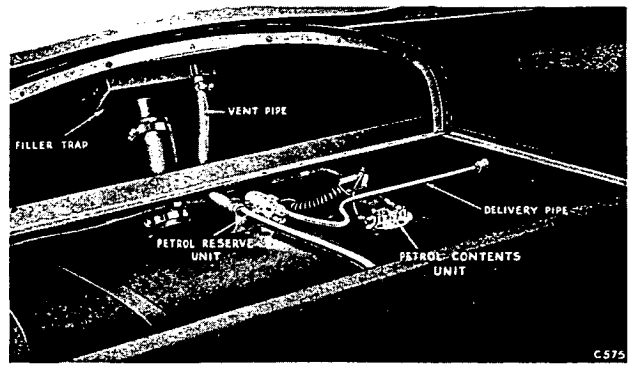


Fig. 183. Petrol tank (Type 404)

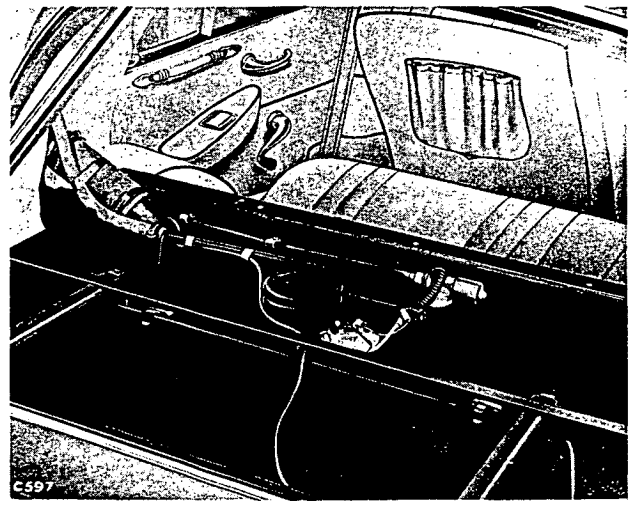


Fig. 184. Petrol tank (Type 405)

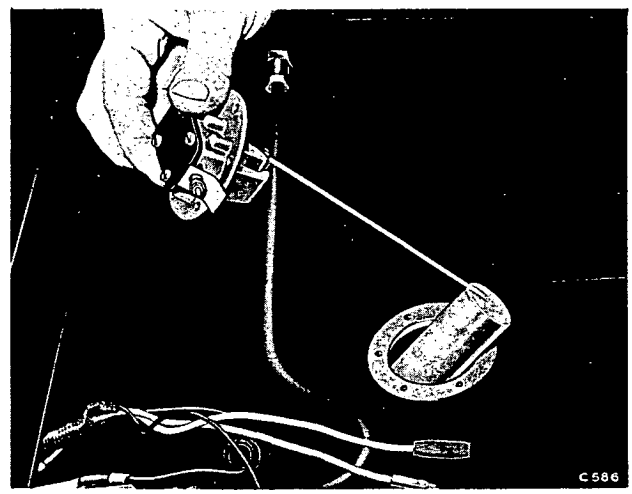


Fig. 185. Removing float unit

Checking

With the unit clear of the car, couple the terminals up to a 12 volt battery when the solenoid should be heard to operate. With the solenoid in operation check that the reserve dip tube (long) is clear by blowing through the

fuel connections. Remove the battery connections then check similarly that the main supply dip tank (short) is clear.

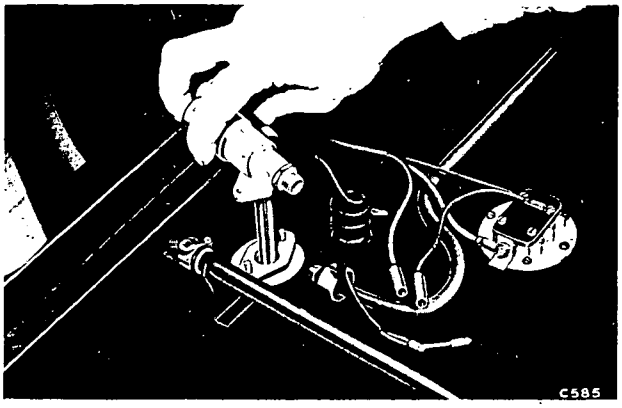


Fig. 186. Removing petrol reserve unit

Refitting

Clean off any traces of the joint washer or jointing compound on the flange of the unit or on the tank aperture.

Apply jointing compound to both sides of a new joint washer. Re-assemble the unit to the tank reversing the procedure for removal.

Type 404 Cars.

Renewing and Re-adjusting Petrol Filler Door Cable

If possible, press the release catch as shown in Fig. 181 to open the petrol filler door. Slide the front passengers seat fully forward. Remove the covering from the handbrake lever and clear the car mats from the cable conduit. Carefully open up the loop on the operating lever and slip out the cable nipple.

If the petrol filler door has been opened, loosen the nut of the cable clamp bolt and release the cable. Pull the cable from the handbrake end, through the conduit.

If the cable is broken, remove the screws securing the luggage tray rear diaphragm and remove the diaphragm. By pulling the conduit away from the filler box, it may be possible to pull the cable, and release the door. If, however, the cable is broken off inside the filler box, remove the cable adjuster, insert a hook of stiff wire and release the door by pulling back the catch.

Prepare a new length of cable, remove the nipple from the old cable and solder it to the new. It should be possible to grease the cable and thread it through the conduit. If not it will be necessary to remove and probably replace the conduit. With the cable well greased thread it through the conduit and refit the conduit.

Connect the nipple at the handbrake release catch and carefully close the eye over the nipple, then connect the cable through the clamp bolt at the filler end, adjusting the cable as near as possible. Final adjustment of the cable is carried out behind the rear diaphragm where the conduit enters the filler box from the tank bay. When the adjustment is satisfactory tighten the adjustment locknut.

The petrol filler door release can be adjusted for position by elongated holes at its base.

Electrical System

List of Contents

List of Contents

List of Contents

Electrical System

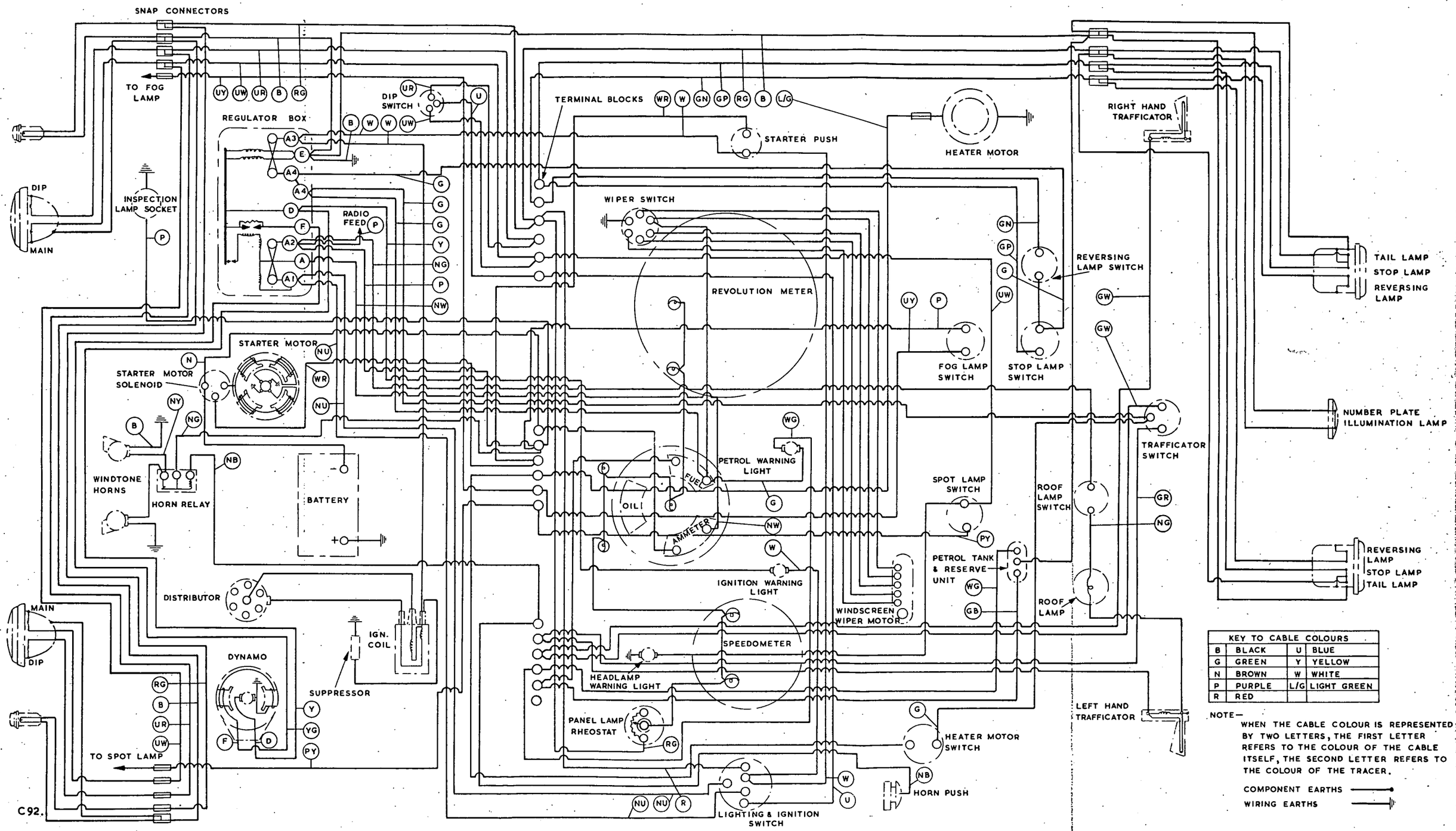
Electrical System

Type 404 Cars

General Data

System		12 volt Positive Earth Return
Regulator Unit		Lucas RF95/2 (Early Type Cars) Lucas RB106/1 (Later Type Cars)
Fuse Base		Lucas SF6 (Later Type Cars)
Battery		
	Type	Lucas GTW9A/2
	Capacity	51 Ampere hours at 10 hr. rate
Switches		
	Lighting & Ignition	Lucas PLC6 (Early Type Cars)
	Lighting & Ignition	Lucas PRS3 (Later Type Cars)
	Panel Light & Rheostat	Lucas CHR1
	Horn Relay	Lucas SB40/1
	Direction Indicator	Lucas TS1
	Starter	Lucas SS5
	Dipper	Lucas FS22
	Fog	Lucas PS16
	Spot	Lucas PS16
	Petrol Reserve	Lucas PS15/1
	Starter Solenoid	Lucas ST950
	Windscreen Wiper	Lucas PRS5
	Map Light	Trico G900/B
	Reverse Light	SS10
	Interior	Smiths 64811
Windscreen Wiper Motor		Lucas 75232A
	Wiper Arm	Lucas 745072
	Wiper Blade	Lucas 738735
Combined Instruments (early type cars)		Smiths X56007/31
	Fuel Gauge Oil Pressure Gauge Ammeter	
	Fuel Gauge (later type cars)	Smiths X49422/227
	Ammeter (later type cars)	Smiths BM4
	Petrol Gauge Float Unit	Smiths EXY 12667 (Early Type Cars) Smiths YB0882/1 (Later Type Cars)
	Petrol Reserve Unit	Lucas 78028A
Radio (special order alternative)		
	Early type cars	
	HMV	Model 4260
	HMV (overseas)	Model 4262
	Ekco	Type CR 152
	Later type cars	
	HMV	Type 200X
	HMV (overseas)	Type 202X
	Ekco	Type CR 152

Lamps		
	Head	Lucas P.700
	Side	Lucas 489
	Combined Stop, Tail & Reverse ...	Lucas 464
	Number Plate	Lucas 467/2
	Fog Lamp	Marchal Rectilux 650. (Later Type Cars)
	Spotlamp	Lucas SLR576S. (Later Type Cars)
	Roof Lamp	Desmo.244
	Map Reading Lamp	Desmo.244
	Inspection Lamp	Minalite
	Fog Lamp (Special order only) ...	SFT700/S (Early Type Cars)
	Spot Lamp (Special order only) ...	SLR700/S (Early Type Cars)
Warning Lamps		
	Main Beam (Red)	Lucas WL.12
	Ignition (Amber)	Lucas WL.12
	Petrol Level (Blue)	Lucas WL.12
	Spare (Green)	Lucas WL.12
Direction Indicator		Lucas SF34 (Chrome plated)
Panel Light		Lucas PL.31
Horns		
	High Note	Lucas WT 614
	Low Note	Lucas WT 614



KEY TO CABLE COLOURS			
B	BLACK	U	BLUE
G	GREEN	Y	YELLOW
N	BROWN	W	WHITE
P	PURPLE	L/G	LIGHT GREEN
R	RED		

NOTE—
WHEN THE CABLE COLOUR IS REPRESENTED BY TWO LETTERS, THE FIRST LETTER REFERS TO THE COLOUR OF THE CABLE ITSELF, THE SECOND LETTER REFERS TO THE COLOUR OF THE TRACER.

COMPONENT EARTHS ——●

WIRING EARTHS ——⏚

Fig. 187. Wiring diagram (early cars)

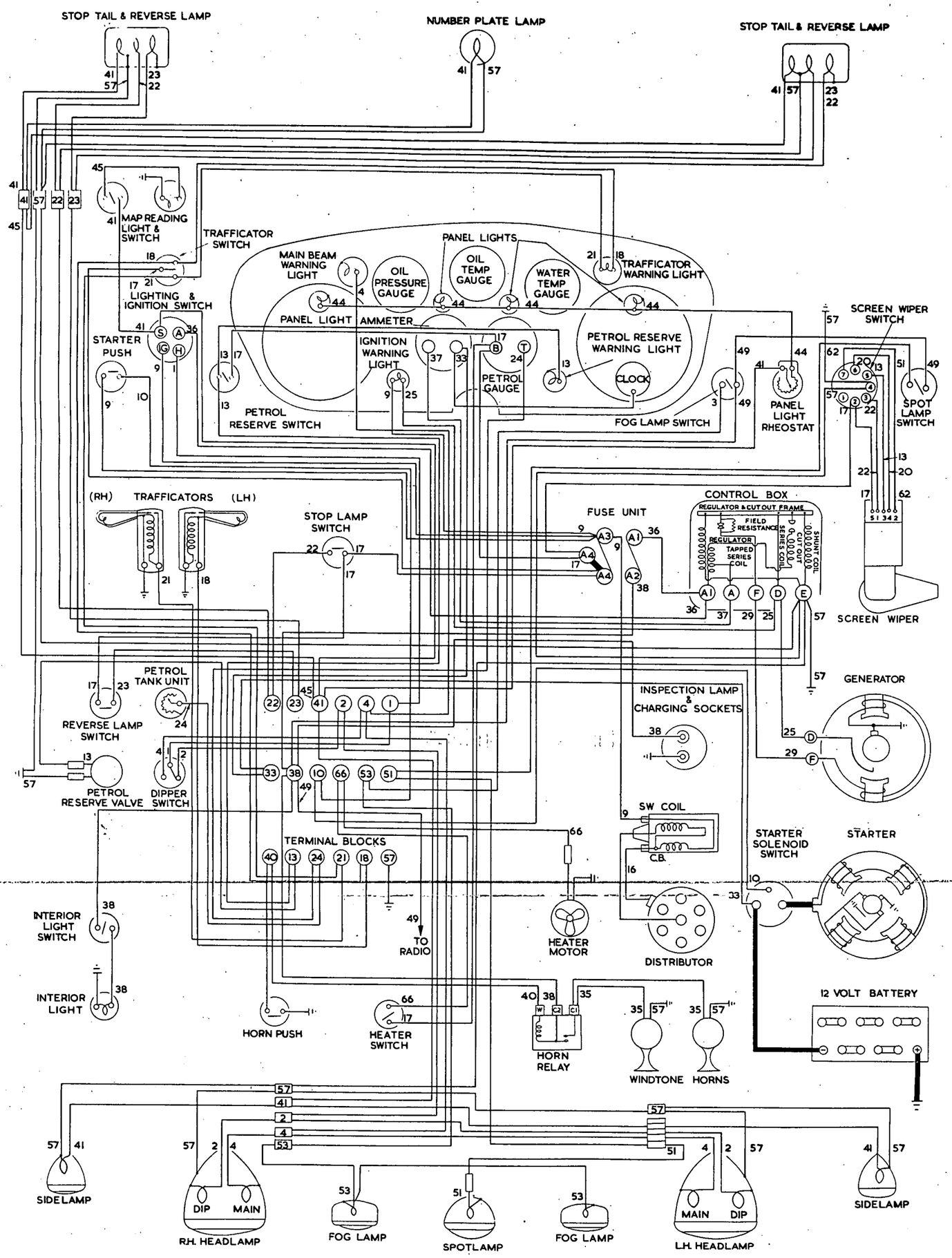


Fig. 188. Wiring diagram (later cars)

KEY TO CABLE COLOURS

1	BLUE	23	GREEN WITH BROWN	45	RED WITH GREEN
2	BLUE WITH RED	24	GREEN WITH BLACK	46	RED WITH PURPLE
3	BLUE WITH YELLOW	25	YELLOW	47	RED WITH BROWN
4	BLUE WITH WHITE	26	YELLOW WITH RED	48	RED WITH BLACK
5	BLUE WITH GREEN	27	YELLOW WITH BLUE	49	PURPLE
6	BLUE WITH PURPLE	28	YELLOW WITH WHITE	50	PURPLE WITH RED
7	BLUE WITH BROWN	29	YELLOW WITH GREEN	51	PURPLE WITH YELLOW
8	BLUE WITH BLACK	30	YELLOW WITH PURPLE	52	PURPLE WITH BLUE
9	WHITE	31	YELLOW WITH BROWN	53	PURPLE WITH WHITE
10	WHITE WITH RED	32	YELLOW WITH BLACK	54	PURPLE WITH GREEN
11	WHITE WITH YELLOW	33	BROWN	55	PURPLE WITH BROWN
12	WHITE WITH BLUE	34	BROWN WITH RED	56	PURPLE WITH BLACK
13	WHITE WITH GREEN	35	BROWN WITH YELLOW	57	BLACK
14	WHITE WITH PURPLE	36	BROWN WITH BLUE	58	BLACK WITH RED
15	WHITE WITH BROWN	37	BROWN WITH WHITE	59	BLACK WITH YELLOW
16	WHITE WITH BLACK	38	BROWN WITH GREEN	60	BLACK WITH BLUE
17	GREEN	39	BROWN WITH PURPLE	61	BLACK WITH WHITE
18	GREEN WITH RED	40	BROWN WITH BLACK	62	BLACK WITH GREEN
19	GREEN WITH YELLOW	41	RED	63	BLACK WITH PURPLE
20	GREEN WITH BLUE	42	RED WITH YELLOW	64	BLACK WITH BROWN
21	GREEN WITH WHITE	43	RED WITH BLUE	65	DARK GREEN
22	GREEN WITH PURPLE	44	RED WITH WHITE	66	LIGHT GREEN

C711

Type 404 Cars

Description

The 12 volt electrical system is a single wire type circuit having the positive (+) pole of the battery earthing to the engine and car. Current is supplied by a two brush dynamo in conjunction with a voltage regulator and an automatic cut out. Two 35 amp fuses are fitted in the accessories circuit.

Wiring Diagram (early type cars). Fig.187.
Wiring Diagram (later type cars). Fig.188.

Dynamo

The dynamo is belt driven and is mounted in a swivelling cradle on the left hand side of the engine and cooled by a fan at the rear of the driving pulley.

Starter Motor

The starter motor (located on the right hand side of the engine) is of normal design with a Bendix type inertia pinion on the worm shaft to engage the flywheel teeth. The direction of rotation is counter clockwise when viewed from the front of the car. Control of the starter motor is via the remote solenoid switch mounted on the right side of the bulkhead.

Voltage Regulator and Fuse Box

Early type cars.

The voltage regulator and cut out are housed on a common base (covered by a single moulded cover) mounted on the control panel in the battery bay. See Fig.189. Below the cover is the main terminal junction block. Two fuses (indicated by the markings 'Aux' and 'Aux Ign') on the regulator unit cover protect certain of the accessories.

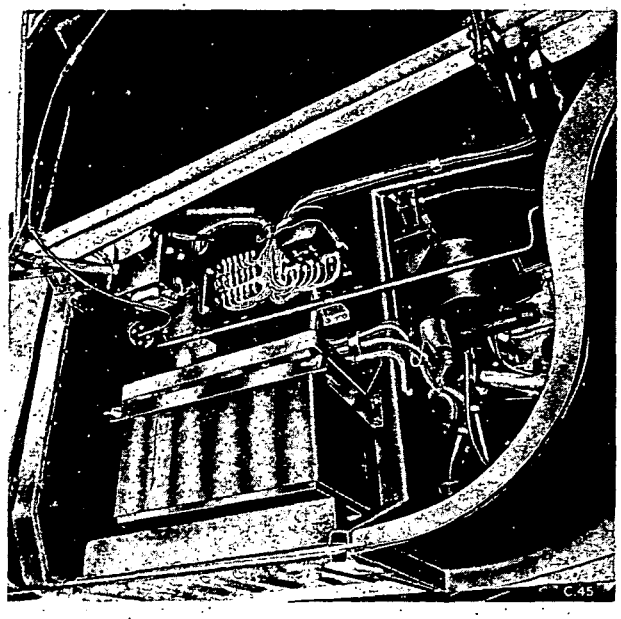


Fig. 189. Voltage regulator and cut out (early cars)

Later type cars.

The voltage regulator and cut out are housed on a common base (covered by a single moulded cover) mounted on the electrical control panel in the battery bay, see Fig.190. The main electrical terminal connections are mounted on the base adjacent to the cover. A block mounted below contains the two fuses.

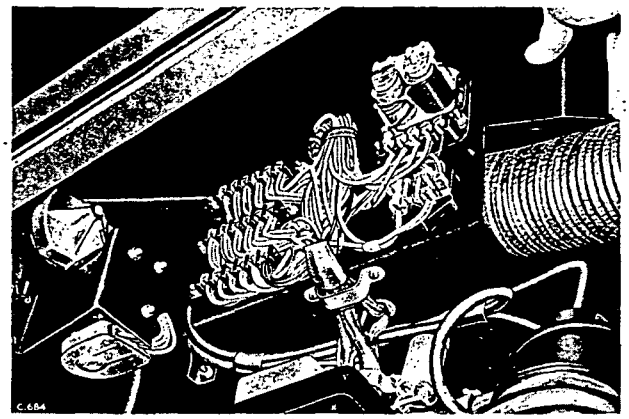


Fig. 190. Voltage regulator and cut out (later cars)

Fuse.	Independant of Ignition Switch.	Controlled by Ignition Switch.
None.	Clock, Head, Side, Tail, Number Plate Lights. Headlamp Warning Light. Panel Lamps. Map Reading Lamp.	Ignition Circuit. Ignition Warning Light. Starter Push Button.
Aux Ign		Brake Stop Lamp. Petrol Gauge. Direction Indicators. Windscreen Wiper Motor. Petrol Reserve Warning Lamp. Reversing Lamp. Demister Motor.
Aux.	Horns, Interior Light. Inspection & Trickle Charger Socket. Fog Lamp. Spot Lamp.	

The voltage regulator controls the output of the dynamo according to the load on the battery and its state of charge. When the battery is in a low state, the dynamo output is high. No adjustment to the regulator or cut out is normally required. Should however any adjustment become necessary it should be entrusted to a recognised Lucas agent.

Battery

The battery is housed in the battery bay on the right hand side of the car immediately to the rear of the front wing. Its positive terminal is earthed, while the negative terminal is connected direct to one terminal of the starter solenoid. The main feed is taken from the same solenoid terminal to the end terminal of the main terminal

junction block within the battery bay. See Fig.189.

Three different types of opening and locking arrangements are incorporated for the valance doors.

Early type cars.

Pull the knob in front door pillar, see Fig.191. Raise the valance door until supported.

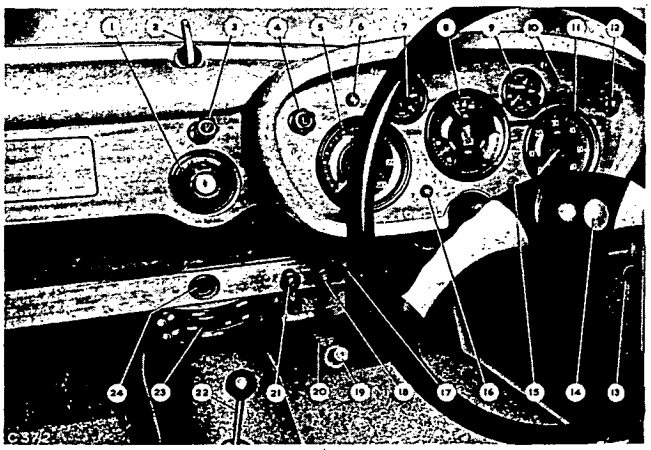


Fig. 191. Instrument panel (early cars)

Intermediate type cars.

Release the locks at each end of the valance door with the square key supplied. Raise the door until supported.

Later type cars.

Release the toggle fastener on the underside of the panel. Lift the safety catch see Fig.192 situated at the rear and raise the door until supported.

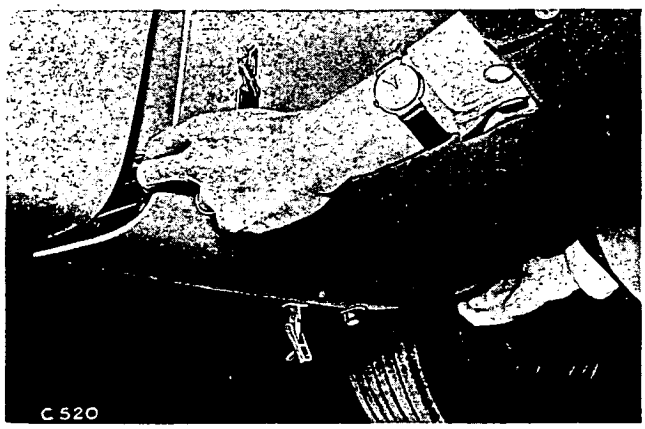


Fig. 192. Opening valance door (later cars)

Ammeter

The ammeter is in circuit with all electrical accessories with the exception of the starter motor and horn relay. The ammeter on early type cars is incorporated in the combined instrument, see Fig.191. For later cars, see Fig.193.

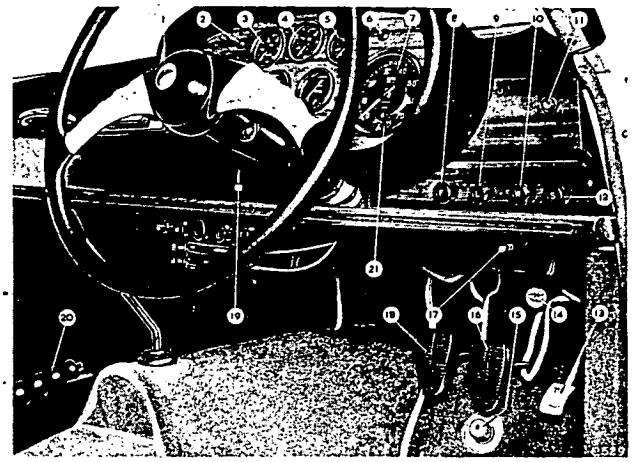


Fig. 193. Instrument panel and controls (later cars)

Brake Lamp Switch

This pressure operated switch is incorporated in the delivery connection on master cylinder as detailed in Brake System of this manual. On left hand drive cars the switch is incorporated in the feed pipe to the left hand brake immediately behind the wheel bay.

Reverse Lamp Switch

The reverse lamp switch is mounted on the right hand side of the gearbox, Fig.194, is of the plunger type and is operated by the reverse gear selector mechanism.

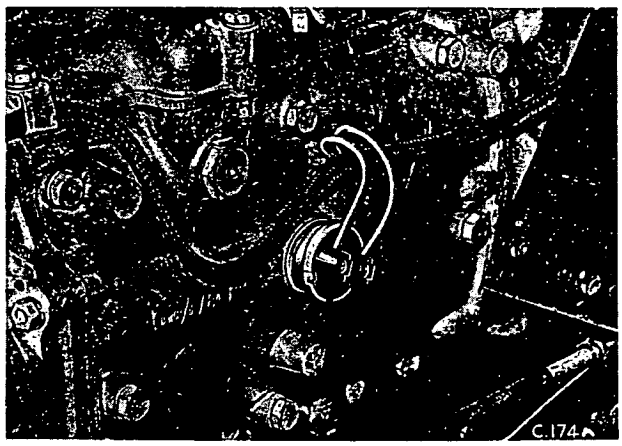


Fig. 194. Reverse light switch

Windscreen Wipers

The windscreen wiper motor and gearbox is mounted in the battery bay. Fig.189. A cable rack transmits motion in two wheel boxes beneath the scuttle facia which operates the wiper blades. No adjustment or lubrication is necessary as all parts are packed with lubricant on assembly.

The motor control knob (marked W) has three positions as follows:-

1 Parking. 2 Normal Running. 3 High Speed Running.

A thermostat cut out switch is built into the wiper motor to prevent overheating. However in order to avoid excessive operation of the switch, the higher speed (3) should only be used during heavy rain and never in snow or on a drying windscreen.

Horns

The push button in the centre of the steering wheel energises a solenoid relay switch situated on the inside of the right hand wheel fairing.

Instrument Panel

The instrument panel is mounted on brackets extending from the rear of the scuttle mounting and is screened by a detachable hood to eliminate reflection. The panel fitted to early type cars is illustrated in Fig.191, while the panel illustrated in Fig.193 for later types. Both panels being illuminated from the rear.

Radio

Radio is an optional fitment. Provision however is made for the installation of the HMV Radiomobile or Ekco together with speaker and aerial.

The HMV radio assembly comprises the control unit and power amplifier. The control unit is mounted in the left hand side of the dashboard and the power amplifier is situated under the bonnet in the LH scuttle compartment.

The Ekco installation uses a power pack in place of the power amplifier. This being the basic difference between the two assemblies.

An inverted coil speaker (6" dia.) is fitted centrally in the roof above the windscreen.

The aerial is positioned centrally to the roof just aft of the windscreen. The aerial lead in and speaker leads pass down through the door pillar and are fitted to all cars during manufacture.

Direction Indicators

The direction indicator switch is mounted centrally under the dashboard and is connected by an extension rod to a control on the dashboard. See Fig.195. The conventional illuminated finger type signals are built into the door pillars. The length of time that the indicator is in operation is controlled by an automatic time switch.

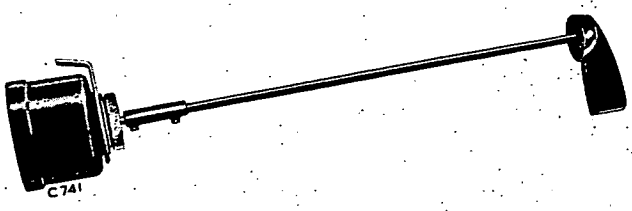


Fig. 195. Direction indicator extension

Head Lamp

Each head lamp incorporates a Lucas Light Unit which comprises a reflector and front glass assembly, provided with a mounting flange by which it is secured to the main body shell. The body shell is secured to the front wing aperture by screws. The two filament prefocus bulb is secured in its holder by a backshell which engages the bayonet socket of the bulb holder and also provides the two electrical contacts. See Fig.196. The bulb and holder are located accurately in relation to the reflector, focusing is therefore automatic and no adjustment is required when replacing a bulb.

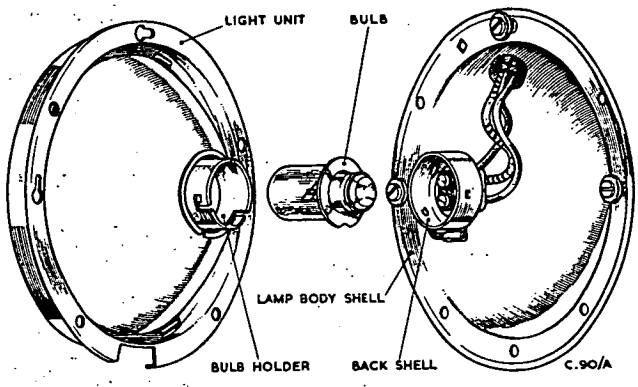


Fig. 196. Headlamp (early cars)

On later type headlamps a safety clip engages slots in the bulb holder to retain the bulb when the backshell is removed. See Fig.197.

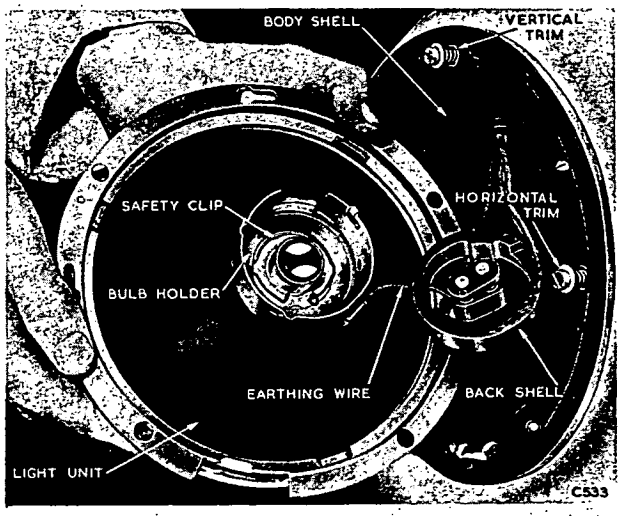


Fig. 197. Headlamp (later cars)

Side Lamps

The side lamps are faired into the wings to offer minimum air flow, the glass and rim being retained in position by a grommet type fixing. See Fig.198.

Stop Tail and Reverse Lamps

The reversing stop and tail lamps, see Fig.199 are incorporated in the same housing, one on each side of the car. The tail and stop lamp is a twin filament bulb 6 watts for the tail and 18 watts for the brake. The

reverse lamp bulb is of the same capacities with only the 18 watt filament in use. The tail and stop lamp bulb is the outer of the two and is shrouded by a red transparent cover. The stop and reversing circuits are energised only when the ignition is switched on.

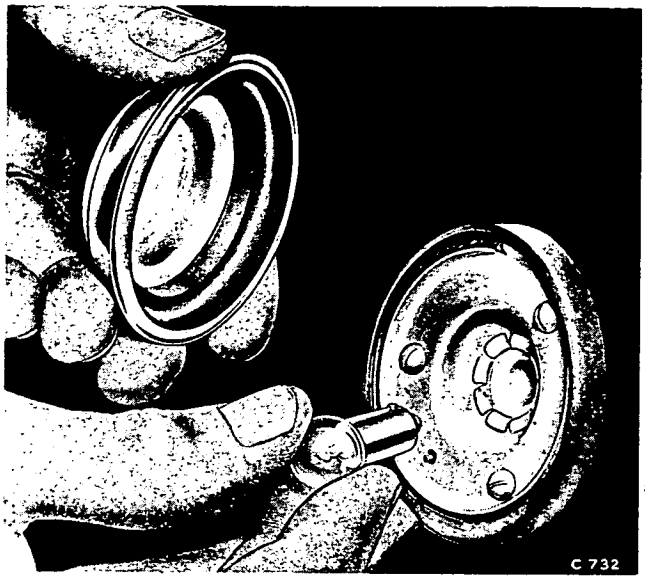


Fig. 198. Replacing sidelamp bulb

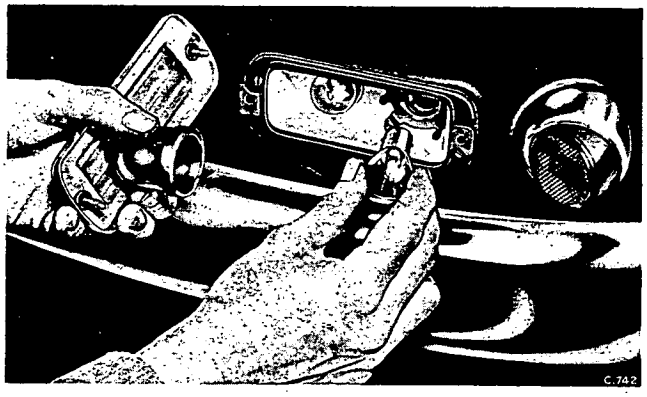


Fig. 199. Replacing stop, tail and reverse lamp bulb

Rear Number Plate Lamp

This lamp, see Fig. 200 is set horizontally in a recess along the top of the number plate, and houses a single filament bulb.

Map Reading Lamp

This lamp (when fitted) is situated beneath the facia panel over the parcel shelf and is controlled by a push switch in the facia panel to the left of the radio control unit.

Fog Lamp

Early type cars.

This lamp (special order only) is mounted above and on the left hand side of the bumper and is controlled by a Push/Pull switch (Marked 'F').

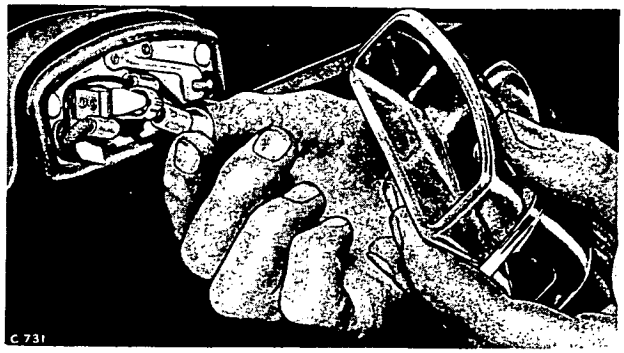


Fig. 200. Rear number plate lamp

Later type cars.

These twin lamps are each mounted on the left and right hand side beneath the bumper and controlled by a Push/Pull switch. (Marked 'F').

Spot Lamp

Early type cars.

This lamp (special order only) is mounted above and on the right hand side of the bumper and is controlled by a Push/Pull switch (Marked 'S').

Later type cars.

This lamp is mounted centrally in the radiator air intake aperture and is controlled by a Push/Pull switch (Marked 'S').

Inspection Lamp

The 'Minalite' type lamp is housed in the right hand side bulkhead compartment beneath the bonnet. When the lamp is connected to the inspection lamp/trickle charger socket the base becomes magnetised and the lamp will therefore adhere to any ferrous metal surface.

Inspection Lamp/Trickle Charger Socket

This electrical supply/feed socket see Fig. 201 is in direct electrical contact with the battery, current can be drawn from the battery, or supplied to it from a trickle charger.

Dipper Switch

This switch is mounted on the toe board and when depressed will raise or dip the head lamp beam, a red warning light coming into operation when the main beam is in circuit.

Servicing

Starter

To Free Jammed Pinion

In the event of the starter pinion becoming jammed in mesh with the flywheel ring it can usually be freed by

removing the protective cap, then apply a spanner to the squared end of the armature shaft and turning in a clockwise direction viewed from the front of the engine. Should persistent jamming occur the starter solenoid and motor should be examined in accordance with the appropriate Lucas instructions.

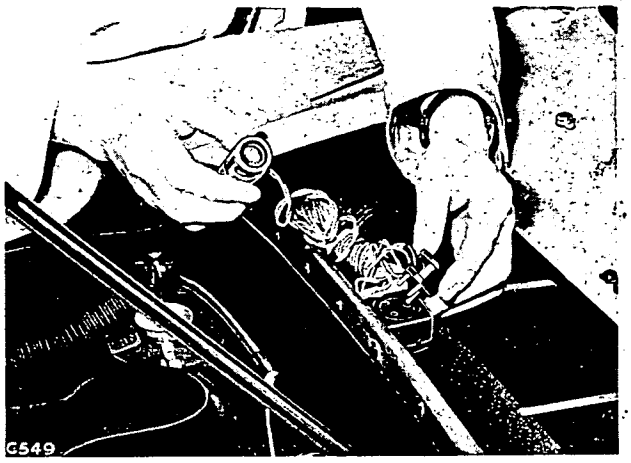


Fig. 201. Inspection lamp and trickle charger socket

Care of the Battery

Always keep the top of the battery clean and dry. Smear the cable terminals with petroleum jelly to prevent corrosion. Periodically a check should be carried out on the level of the electrolyte in each cell. The rate of evaporation of the electrolyte varies according to the use of the battery and the temperature in which it is operating. Never use a naked light over cells, since the gas is explosive. If 'topping up' is required, use only pure distilled water which must not contact metal (metal funnel or container). The tops of the plates should just be covered. Do not over fill since this will cause a violent discharge of gas when the battery is being charged by the dynamo resulting in damage to the surrounding metal work.

Occasionally take hydrometer readings to check the conditions of each cell as follows:-

Climate.	Hydrometer readings.		
	Charged.	1/2 Charged	Discharged.
Temperate Up to 80° F. (27° C.)	1.280 to 1.300	Approx. 1.210	1.150 or less.
Sub-tropical 80°F to 100°F (27°C to 38°C)	1.250 to 1.270	-	-
Tropical Over 100°F (38°C)	1.220 to 1.240	-	-

Brake Lamp Switch

Removing and refitting.

Disconnect the cables then unscrew and remove the switch from the master cylinder, see Fig.202. Refit the switch, connect the cables and finally bleed the brakes.

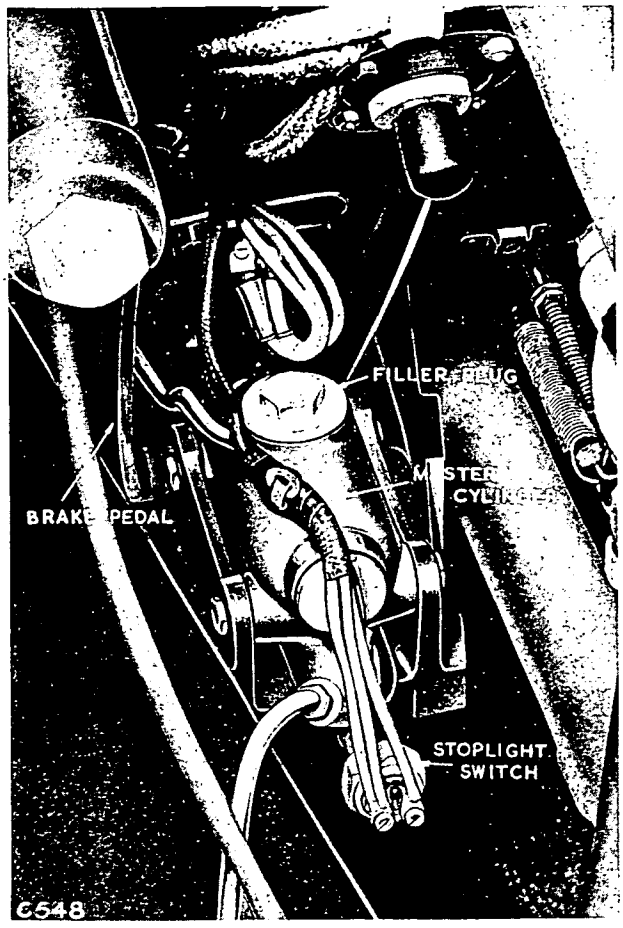


Fig. 202. Brake lamp switch

Windscreen Wiper Motor

Removing and refitting.

Remove the wiper arms and blades, disconnect the battery and then the five cables from the wiper motor.

Remove the screws attaching the wiper motor mounting bracket to the car body and unscrew the nut attaching the cable casing to the motor. Withdraw the motor complete with the mounting bracket and the cable. Detach the mounting bracket from the motor.

Should it be possible to obtain a replacement motor with an identical length cable the existing cable need not be detached. Failing this it will be necessary to transfer the cable from the faulty motor to the replacement.

To refit the motor from this stage, fit the mounting bracket, smear the cable with grease and feed it through

the cable casing, finally screwing on the nut to secure the casing to the motor. Attach the mounting bracket to the car body and reconnect the five cables to the motor.

Reconnect the battery and with the wiper spindles in the stationary position, refit the wiper arms and blades and check the arc of wipe.

Horns

Adjustment and refitting.

The horns will give long periods of service without attention under normal circumstances. If however the performance of one or both horns becomes uncertain, make sure that some outside source is not the cause of the trouble, ie, a loose connection, blown fuse or any loose metal parts in the vicinity of the horns which will vibrate when the horn is energised.

The adjustment provided in each horn will take up wear in the moving parts but will not affect the note pitch.

To gain access to the horns, remove the bonnet, disconnect the supply lead from one horn remove the central fixing screw of the other and detach the domed cover. Then remove the cover securing bracket by springing it from its mounting. Slacken the locknut of the fixed contact and turn the adjusting nut until the contacts are just separate, see Fig.203.

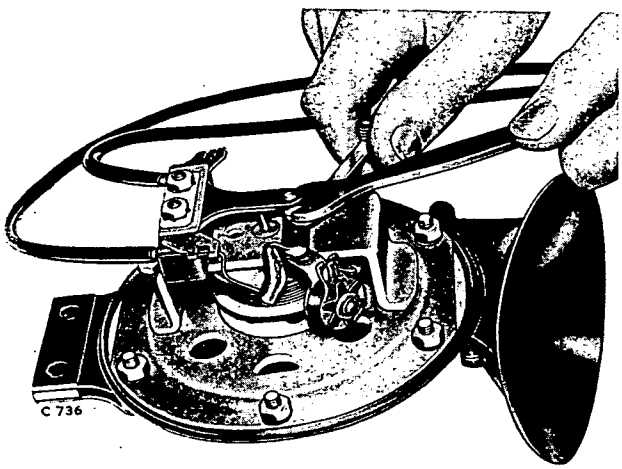


Fig. 203. Horn adjustment

The correct initial setting is when the horn just fails to sound when the button is depressed, then turn the adjusting screw 1/2 turn in the opposite direction, then lock in position. Test the horn, if it fails to sound correctly re-assemble it and return it to a Lucas Service Depot. If satisfactory the procedure for refitting is reversed.

Radiomobile Radio

Removing and Refitting.

1. Disconnect the battery.

Control Unit

2. To remove the control unit from the dashboard, disconnect the connector link (the cable loom from the control unit to the amplifier unit), fuse holder and aerial, remove the four screws supporting the control unit and withdraw the unit through the dashboard.

   If it is necessary at any time to replace a control unit it should be noted that the original chromium plated bezel, dial and spring loaded control knob be retained and re-assembled to the new unit.

3. For refitting the procedure is reversed.

Power Amplifier

4. To remove the amplifier unit disconnect the connecting link, speaker plug and the two bolts attaching the unit to its mounting bracket. A waterproof cover is fitted over the unit, and attached by four bolts.

   If it is necessary to replace an amplifier the original waterproof cover and the mounting bracket must be transferred.

5. For refitting the procedure is reversed.

Echo Radio

Removing and Refitting.

1. Disconnect the battery.

Control Unit

2. To remove the control unit from the dashboard disconnect the connector link (the cable loom from the control unit to the power pack) fuse holder and aerial. Remove the screws supporting the control unit and withdraw the unit through the dashboard.

3. For refitting the procedure is reversed.

Power Pack

4. To remove the power pack disconnect the connector link, speaker plug and the two attachment screws.

5. For refitting the procedure is reversed.

Speaker

Removing and Refitting.

1. Disconnect the battery.

2. Remove the screws securing the speaker grille ring and remove the rings and grille.

3. Remove the screws securing the speaker board then lower the speaker and detach the leads.

4. For refitting the procedure is reversed.

Aerial

Removing and Refitting.

To remove the aerial, carry out the instructions

for removing the speaker, then disconnect the aerial lead and remove the hexagonal screw securing the aerial. Remove the aerial and insulating grommet.

For refitting the procedure is reversed.

Direction Indicators

Removing and Refitting.

Release the quarter light fillet screws, remove the door aperture fillet and interior roof light switch (RH side pillar only). Remove the indicator trimming panel, remove the two screws securing the indicator bracket to the door pillar. Disconnect the single wire from the indicator and remove the screw securing the indicator to the bracket.

For refitting the procedure is reversed.

Direction Indicator Switch

Removing and Refitting.

1. Working from beneath and to the rear of the dashboard remove the 6 BA screw securing the extension shaft to the sleeve, see Fig.195.
2. Remove the ring nut and washer.
3. Disconnect the cables and remove the switch from its support bracket.
4. For refitting the procedure is reversed.

Note. If a replacement switch is fitted the sleeve must be transferred.

Removing and Refitting Instruments

Speedometer and Revolution Counter

Early type cars. See Fig. 204.

Working from beneath the instrument panel detach the flexible drive by releasing the hand nut. Remove the two hand nuts either side of the instruments followed by the earthing cables on the inner stud. Remove the clamping plate. The instrument can then be withdrawn from the face of the panel.

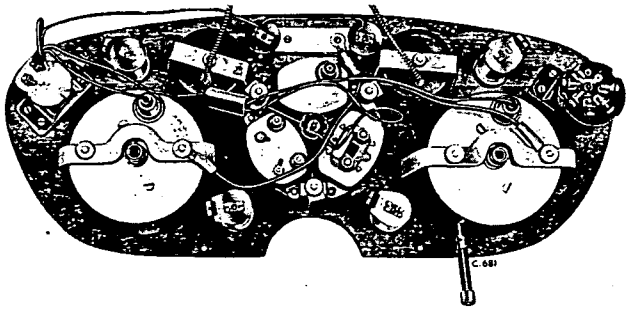


Fig. 204. Instrument panel - rear view (early cars)

For refitting the procedure is reversed.

Oil Temperature Gauge

To remove the oil temperature gauge first drain the oil sump and disconnect the bulb from the left hand side of the sump. Release the necessary securing clips and grommets from the capillary.

Remove the speedometer. Using the speedometer aperture in the panel release the hand nut clamping plate. The instrument can then be withdrawn from the face of the panel.

For refitting the procedure is reversed.

Water Temperature Gauge

The instructions for removing the water temperature gauge are similar to that for the oil temperature gauge the differences being, drain the water system, disconnect the bulb from the right hand side of the cylinder block, remove the revolution counter.

Combined Instrument

To remove the combined instrument disconnect the battery, remove the speedometer and disconnect the oil pressure pipe from the rear of the oil pressure gauge. Remove the six screws securing the panel. Withdraw the panel to rest upon the steering column. The combined instrument can then be removed, after disconnecting and identifying the various cables and connections.

For refitting the procedure is reversed.

Replacing Bulbs

Ignition and Fuel Reserve Warning Lights. Speedometer and Revolution Counter Illuminating Lamps

These bulbs can be removed and replaced by working from beneath with the instrument panel in situ.

Head Lamp Warning Lamp

This bulb can be removed and replaced by first removing the speedometer.

Oil and Water Temperature and Combined Instrument Illumination Lamps

To remove and replace these bulbs it will be necessary to remove the instrument panel.

Removing and Refitting Instruments

Speedometer

Later Type cars. See Fig. 205.

Working from beneath the instrument panel detach the flexible drive by releasing the hand nut. Remove the two hand nuts either side of the instrument followed by the earthing cables on the inner stud. Remove the clamping plate. The instrument can then be withdrawn from the face of the panel.

For refitting the procedure is reversed.

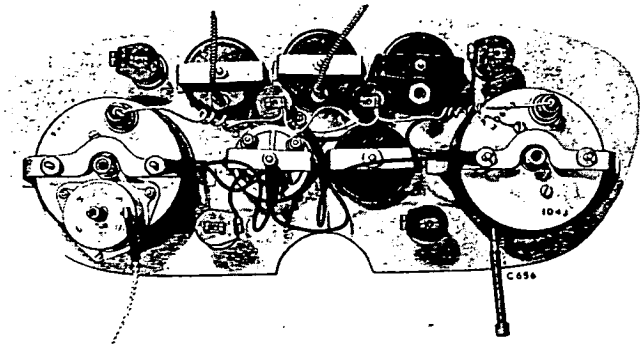


Fig. 205. Instrument panel - rear view (later cars)

Revolution Counter

The instructions for removing the revolution counter are similar to that for the speedometer. In addition disconnect the battery, the hand winder and electric supply feed to the clock, prior to withdrawing the instrument from the panel.

For refitting the procedure is reversed.

Oil Pressure Gauge

To remove the oil pressure gauge first remove the speedometer. Using the speedometer aperture in the panel disconnect the oil pressure pipe from the rear of the instrument. Remove the hand nut and clamping plate. The instrument can then be withdrawn from the face of the panel.

For refitting the procedure is reversed.

Oil Temperature Gauge

To remove the oil temperature gauge first drain the sump and disconnect the bulb from the left hand side of the sump. Detach the necessary clips and grommets from the capillary. Remove the revolution counter in order to remove the adhesive tape securing the two capillaries (oil & water) to each other. Remove the six screws attaching the panel shroud and pull the shroud forward to rest upon the steering column. Working from the top of the instrument panel remove the hand nut and clamping plate. The instrument can then be withdrawn from the face of the panel.

For refitting the procedure is reversed.

Water Temperature Gauge

To remove the water temperature gauge, drain the water system and disconnect the bulb from the right hand side of the cylinder block. Disconnect the necessary clips and grommets from the capillary. Remove the revolution counter, using the revolution counter aperture in the panel, remove the hand nut and clamping plate, the instrument can then be withdrawn from the face of the panel.

For refitting the procedure is reversed.

Fuel Gauge

To remove the fuel gauge remove the revolution counter. Using the revolution counter aperture in the panel remove the hand nut and earthing cable followed by the clamping plate. Withdraw the fuel gauge just forward of the panel and disconnect the feed and return lead from the back of the gauge.

For refitting the procedure is reversed.

Ammeter

To remove the ammeter disconnect the battery, remove the speedometer, using the speedometer aperture in the panel remove the hand nut and clamping plate. Withdraw the ammeter just forward of the panel and disconnect the feed and return leads from the back of the instrument.

For refitting the procedure is reversed.

Replacing Bulbs

Fuel and Ignition Warning Lights. Speedometer and Revolution Counter Illuminating Lamps

These bulba can be removed and replaced from beneath with the instrument panel in situ.

Headlamp Warning Lamp.

This bulb can be removed and replaced by removing the speedometer and working through the aperture in the panel.

Direction Indicator Warning Lamp

This bulb can be removed and replaced by removing the revolution counter and working through the aperture in the panel.

Oil and Water Temperature, Oil Pressure, Fuel and Ammeter Illuminating Lamps

These two lamps can be removed and replaced after removing the panel shroud.

Headlamps

Replacing a Bulb.

Early type cars.

Remove the rim and seal by releasing the securing screw at the bottom of the rim, see Fig.206. Press and twist anticlockwise to withdraw the light unit. From the rear of the light unit press and twist anticlockwise on the back shell, then withdraw it as shown in Fig.196. Lift the bulb from its holder be careful that it does not fall out.

When refitting, the bulb and back shell can only be assembled in the correct position. Refit the complete light unit, front seal and rim. Finally tighten the pinch screw positioned at the bottom.

Later type cars.

Remove the rim and rubber seal by releasing the securing screw at the bottom of the rim. Press and twist anticlockwise to withdraw the light unit. From

the rear of the light unit press and twist anticlockwise on the back shell, then withdraw it as shown in Fig.197. Remove the earth wire, safety clip and lift out the bulb.

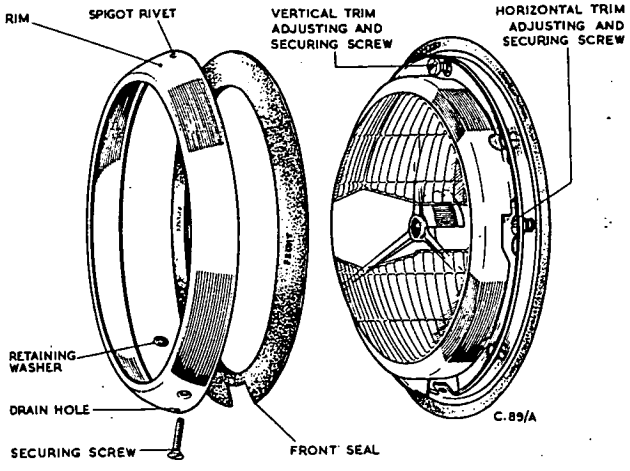


Fig. 206. Replacing headlamp bulb

When reassembling ensure that the slot in the rubber seal coincides with the screw in the rim.

Setting the Beam

No adjustment is necessary under normal conditions of use, even after fitting a new bulb, but vertical and horizontal adjustment is provided.

To effect adjustment proceed as follows:

1. Set the car on level ground at an approximate distance of 20 to 30ft from and face a blank wall.
2. Remove the lamp rims and seals.
3. Switch on the lights and note the position of the light circles on the wall in relation to the spacing of the lamps on the car.
4. To raise the beam screw the vertical trim adjusting screw clockwise or vice versa.
5. To turn the beam horizontally manipulate the sprung loaded horizontal trim adjusting screw as necessary.

When adjustment is satisfactory see Fig.207. Refit the seals and rims.

Replacing Bulbs

Side Lamps

To replace a side lamp bulb, ease the glass and rim from the grommet fixing see Fig.198.

Stop Tail and Reverse Lamps

Obtain access to the bulbs by removing the rim attachment screws. The reverse lamp bulb is then exposed. To gain access to the stop and tail light bulb pull off the red transparent cover, see Fig.199.

Rear Number Plate Lamp

Release the central cover attachment screw and withdraw the cover downwards see Fig.200.

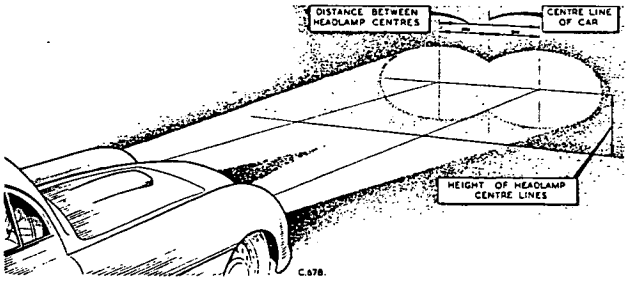


Fig. 207. Setting headlamp beam

Direction Indicators

Move the direction indicator switch to energise the solenoid. Prevent the arm locking in the closed position. Remove the screw from the end of the arm and slide off the metal cover to gain access to the bulb. See Fig.208.

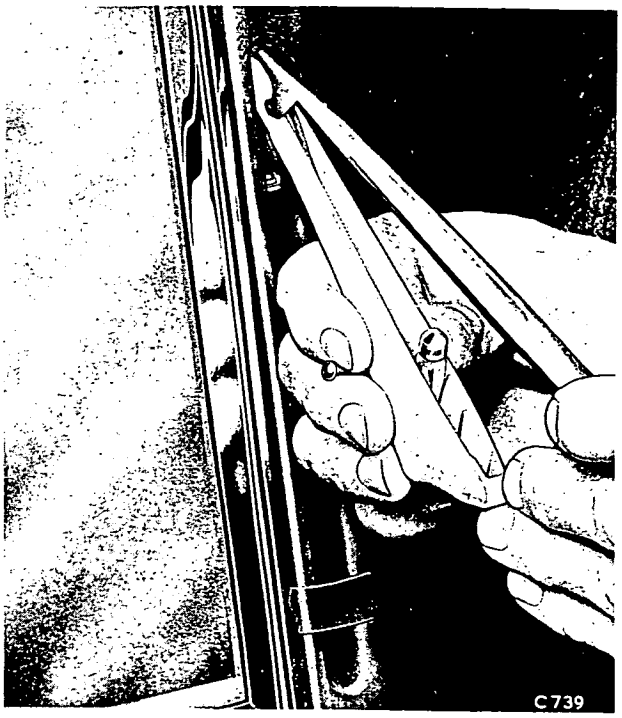


Fig. 208. Replacing direction indicator bulb

Map Reading Lamp
Interior Lamp

Remove the screws securing the rim, and cover glass and remove the bulb.

Spot Lamp and Fog Lamp

Replacing a bulb (early type cars).

Remove the rim and front seal by releasing the securing screw at the bottom. Press and twist anti-clockwise to withdraw the light unit. From the rear of

the light unit remove the circlip followed by the bulb and the shield.

When fitting a new bulb, first fit the shield, (this can only be fitted one way) insert the bulb, (either way) assemble the circlip, light unit, front seal and rim. Finally tighten the pinch bolt which must be positioned at the bottom.

Adjusting the Beam (Early Type Cars)

The lamp is provided with a spherical seating and is therefore adjustable in all directions. To adjust loosen the securing nut below the mounting bracket, adjust as required, then retighten the nut.

Fog Lamp

Replacing a bulb (later type cars).

Remove the two screws securing the rim to the body then lift out the rim complete with the reflector assembly. Turn the bulb holder anticlockwise and remove from the rear of the reflector see Fig.209. Remove the bulb.

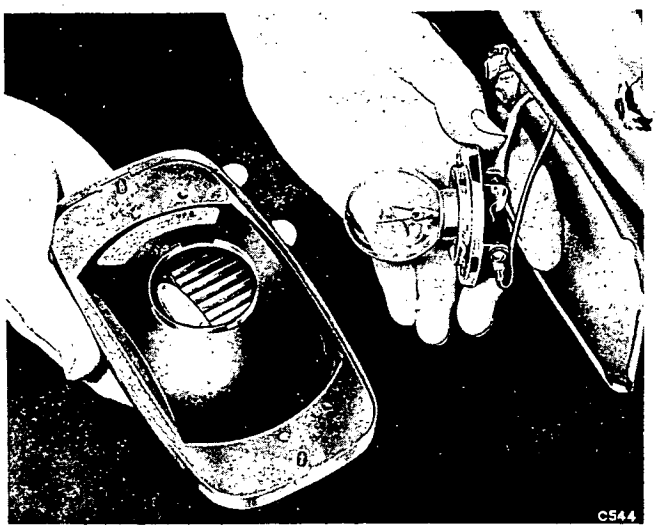


Fig. 209. Replacing fog lamp bulb later cars

For refitting the procedure is reversed.

Adjusting the Beam (Later Type Cars)

The lamps are provided with a spherical seating and is therefore adjustable in all directions. To adjust, loosen the securing nut above the mounting bracket, adjust as required, then retighten the nut.

Spot Lamp

Replacing a bulb (later type cars).

Remove the front rim by releasing the captive clamp screw at the top. Lift out the light unit, see Fig.210. Remove the circlip retaining the bulb holder in the rear of the reflector and withdraw the holder and bulb. Remove the bulb.

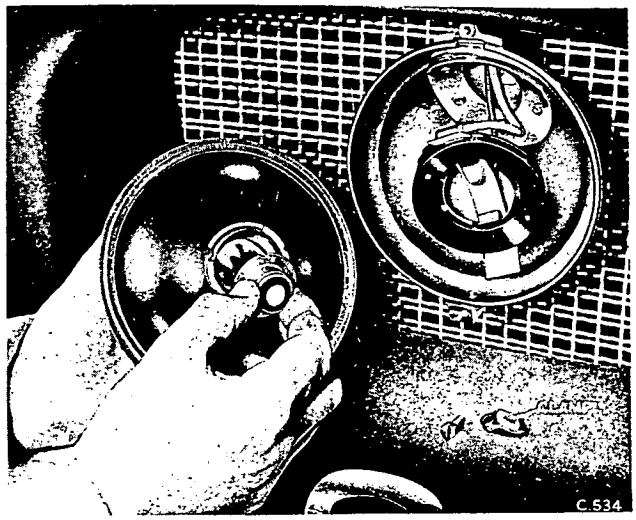


Fig. 210. Replacing spot lamp bulb

For refitting the procedure is reversed.

Adjusting the Beam (Later Type Cars)

The lamp is provided with a spherical seating and is therefore adjustable in all directions. To adjust first remove the bonnet, loosen the securing nut on top of the mounting bracket, adjust as required, retighten the nut and assemble the bonnet.

Type 405 Cars
General Data

Regulator Unit	Lucas RB106/1. (Early Type Cars) Lucas RB320. (Later Type Cars)
Fuse Base	Lucas SF6
Battery	
Type	Lucas GTW9A/2
Capacity	51 Ampere hours at 10 hr. rate.
Switches	
Lighting & Ignition	Lucas PRS3
Panel Light Rheostat	Lucas CHR1
Horn Relay	Lucas SB40/1
Flasher Unit	Lucas FL5
Double Relay for Flashers	DB10
Petrol Reserve	Lucas PS15/1
Interior	Wilmot Breedon 8715B
Starter	Lucas SS5
Dipper	Lucas FS22
Fog	PS16
Spot	PS16
Reverse	SS10
Starter Solenoid	ST 950
Windscreen Wiper	Lucas PRS5
Map Light	Trico G900/B
Relay (Fog & Spot)	Lucas LIR. (Later Type Cars)
Boot Light	Lucas 94
Overdrive	Lucas 31500B
Windscreen	
Motor & Gearbox	Lucas 75232A
Wiper Arm	Lucas 741837
Wiper Blade	Lucas 738735
Lamps	
Head	Lucas P.700
Side	Lucas 539
Combined Stop, Rear, Direction Indicator & Reflector	Lucas 551
Number Plate & Reverse	Lucas 469
Fog	Marchal Rectilux 650
Spot	Lucas SLR576 S
Interior	Wilmot Breedon 12136
Boot	Desmo 244
Map Reading	Desmo 244
Inspection	Minalite
Warning Lamps	
Main Beam (Red)	Lucas WL12
Ignition (Amber)	Lucas WL12
Petrol Reserve (Blue)	Lucas WL12
Direction Indicator	Lucas WL12
Fuel Gauge	Smiths X49422/232
Ammeter	Smiths BM4
Petrol Gauge Float Unit	Smiths Y86049
Petrol Reserve Unit	Lucas 78029A
Panel Light	Lucas PL31

Radio (special order only) ... ..

Early type cars

HMV	Type 4260
HMV (overseas)	Type 4262
Ekco	Type CR152

Later type cars

HMV	Type 200X
HMV (overseas)	Type 202X
Ekco	Type CR152

Horns ... ...

High Note	Lucas WT614 (Early Type Cars)
Low Note	Lucas WT614 (Early Type Cars)
High Note	Lucas WT618 (Later Type Cars)
Low Note	Lucas WT618 (Later Type Cars)

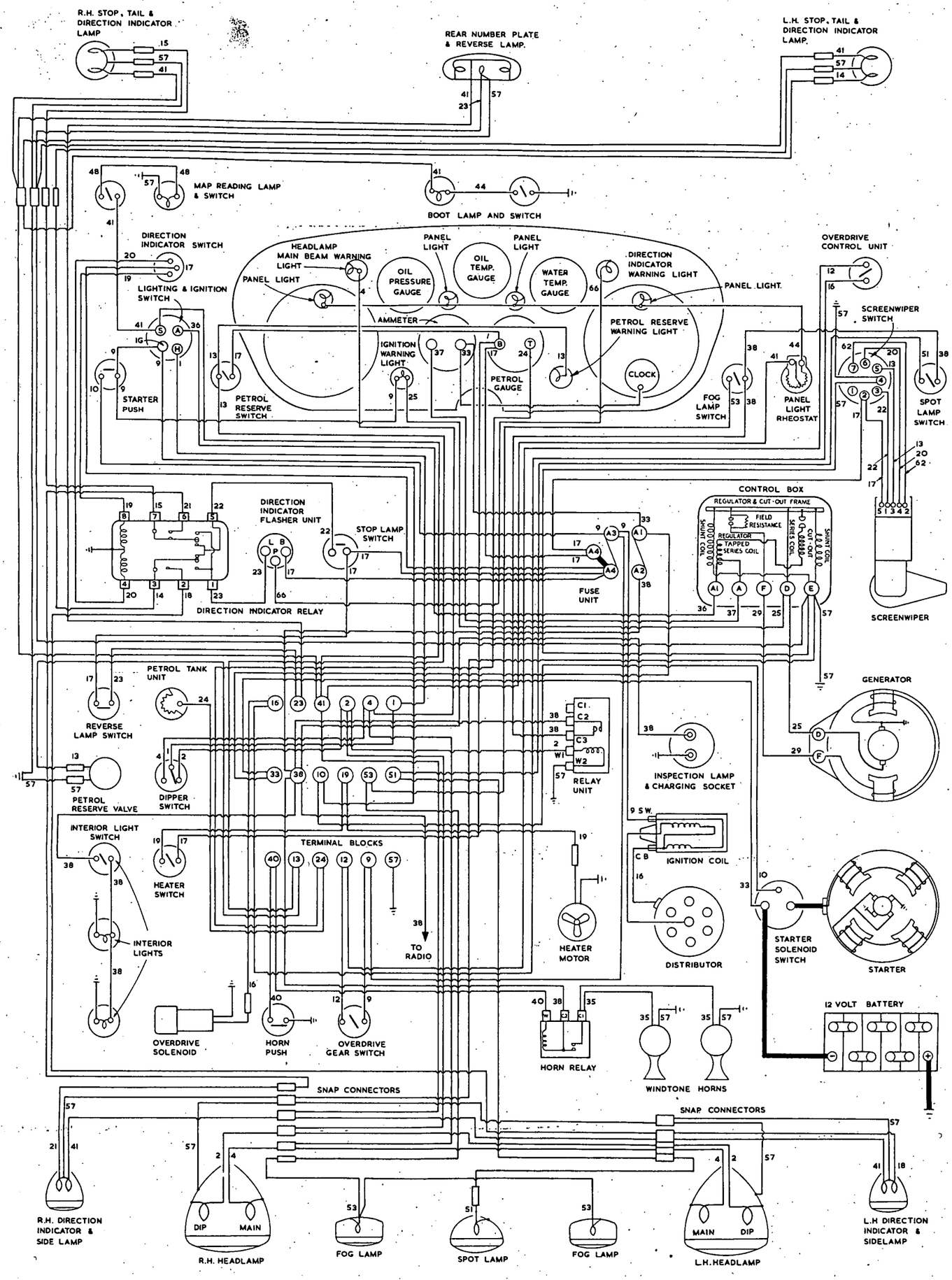


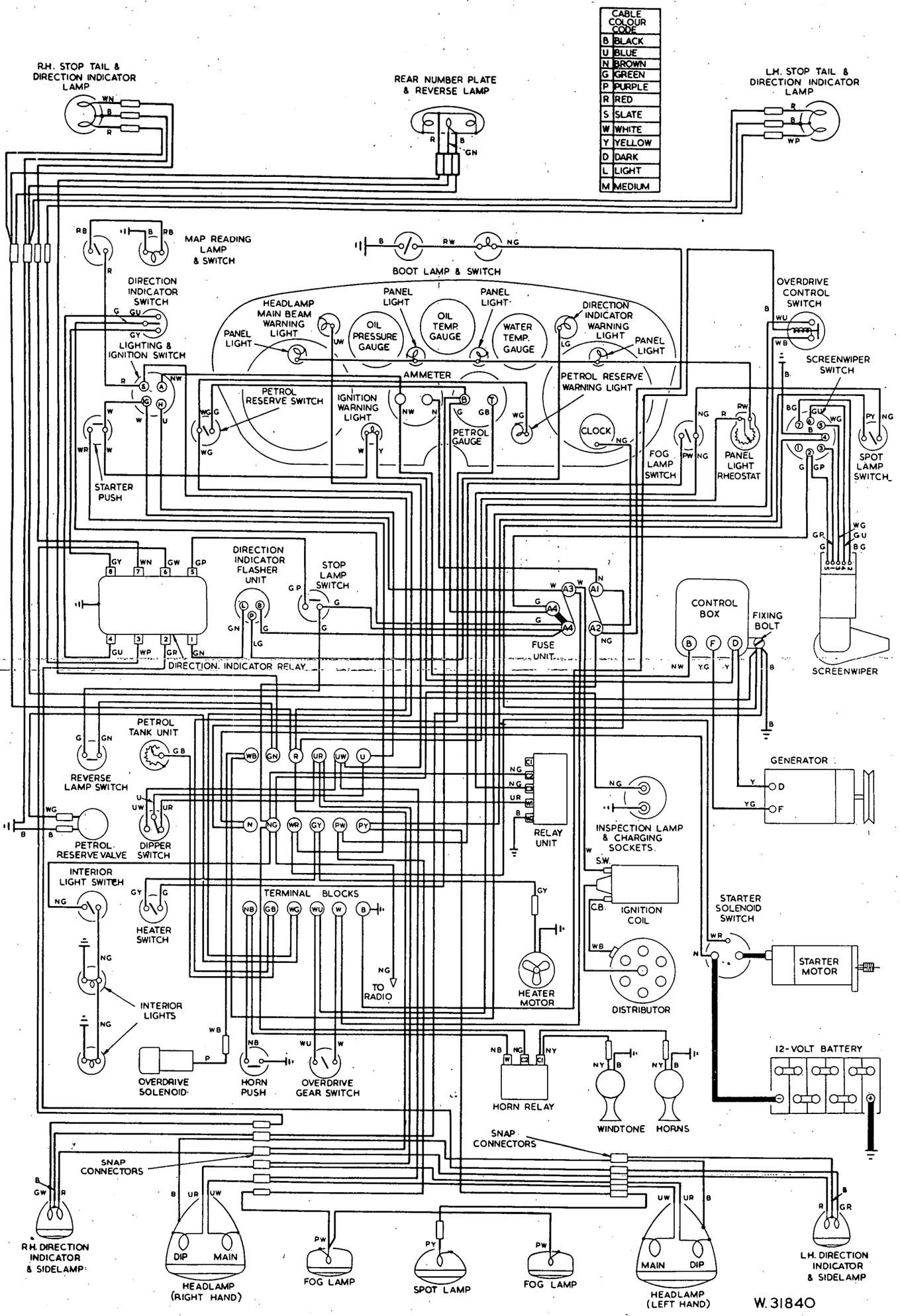
Fig. 211. Wiring diagram early cars

KEY TO CABLE COLOURS

1	BLUE	23	GREEN WITH BROWN	45	RED WITH GREEN
2	BLUE WITH RED	24	GREEN BLACK	46	RED PURPLE
3	BLUE YELLOW	25	YELLOW	47	RED BROWN
4	BLUE WHITE	26	YELLOW WITH RED	48	RED BLACK
5	BLUE GREEN	27	YELLOW BLUE	49	PURPLE
6	BLUE PURPLE	28	YELLOW WHITE	50	PURPLE WITH RED
7	BLUE BROWN	29	YELLOW GREEN	51	PURPLE YELLOW
8	BLUE BLACK	30	YELLOW PURPLE	52	PURPLE BLUE
9	WHITE	31	YELLOW BROWN	53	PURPLE WHITE
10	WHITE WITH RED	32	YELLOW BLACK	54	PURPLE GREEN
11	WHITE YELLOW	33	BROWN	55	PURPLE BROWN
12	WHITE BLUE	34	BROWN WITH RED	56	PURPLE BLACK
13	WHITE GREEN	35	BROWN YELLOW	57	BLACK
14	WHITE PURPLE	36	BROWN BLUE	58	BLACK WITH RED
15	WHITE BROWN	37	BROWN WHITE	59	BLACK YELLOW
16	WHITE BLACK	38	BROWN GREEN	60	BLACK BLUE
17	GREEN	39	BROWN PURPLE	61	BLACK WHITE
18	GREEN WITH RED	40	BROWN BLACK	62	BLACK GREEN
19	GREEN YELLOW	41	RED	63	BLACK PURPLE
20	GREEN BLUE	42	RED WITH YELLOW	64	BLACK BROWN
21	GREEN WHITE	43	RED BLUE	65	DARK GREEN
22	GREEN PURPLE	44	RED WHITE	66	LIGHT GREEN

C 664

Fig. 212. Wiring diagram later cars



Type 405 Cars

Description

The 12 volt electrical system is a single wire type circuit having the positive (+) pole of the battery earthed to the engine and body, see Fig.211 for early type cars and Fig.212 for later type cars. Current is supplied by a two brush dynamo in conjunction with a voltage regulator (on later type cars combined current/voltage regulator) and an automatic cut out. Two 35 Amp. fuses are fitted in the accessories circuit.

Dynamo

The dynamo is belt driven and is mounted in a swivelling cradle on the left hand side of the engine and cooled by a fan at the rear of the dynamo.

Starter Motor

The starter motor (located on right hand side of the engine) is of normal design with a 'Bendix' type inertia pinion on a worm shaft to engage the flywheel teeth. The direction of rotation is counter clockwise when viewed from the front of the car. Control of the starter motor is via the remote solenoid switch mounted on the right hand side of the bulkhead.

Voltage Regulator and Fuse Box

The voltage regulator (later cars combined current/voltage regulator) and cut out are housed on a common base (covered by a single cover) mounted on the electrical control panel in the battery bay, see Fig.213. The main electrical connections are mounted on the base adjacent to the cover. Two fuses (indicated by the markings ('Aux and Aux Ign') are contained on a block mounted immediately below the regulator. These fuses protect certain accessories as follows:

Fuse.	Independant of Ignition Switch.	Controlled by Ignition Switch
None.	Clock. Head. Side Tail. Number Plate Lamps. Headlamp Warning Light. Panel & Map Reading Lamps. Boot Lamp (early type cars).	Ignition Circuit and Warning Light. Starter Push Button.
Aux.Ign.		Brake Stop. Petrol Gauge. Flasher Indicators. Flasher Indicator Warning Light. Windscreen Wiper Motor. Petrol Reserve Warning Lamp. Reversing Lamp. Demist Motor.
Aux.	Horns. Interior Light. Inspection & Trickle Charger Socket. Fog. & Spot Lamp. Boot Lamp. (later cars).	

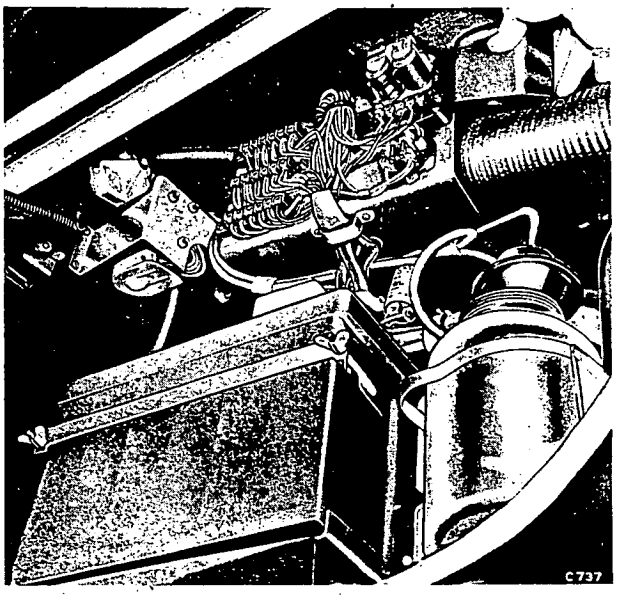


Fig. 213. Voltage regulator and fuse box

The regulator controls the output of the dynamo according to the load on the battery and its state of charge. When the battery is in a low state, the dynamo output is high.

No adjustment to the regulator or cut out is normally required should however any adjustment become necessary it should be entrusted to a recognised Lucas agent.

Battery

The battery is housed in the battery bay on the right hand side of the car immediately to the rear of the front wing. Its positive terminal is earthed while the negative terminal is connected direct to one terminal of the starter solenoid. The main feed is taken from the same solenoid terminal to the end terminal junction box within the battery bay.

To open the valance door see Fig.192. Release the toggle fastener on the underside of the panel. Lift the safety catch at the rear and raise the door until supported.

Ammeter

The ammeter is positioned on the dashboard and is in circuit with all electrical accessories except the starter motor and horn relay.

Brake Lamp Switch

The pressure operated switch is incorporated in the delivery connection of the master cylinder as detailed in Brake System of this manual. On left hand drive cars the switch is incorporated in the feed to the L.H. front brake immediately behind the wheel bay.

Reverse Lamp Switch

The reverse lamp switch is mounted on the right hand side of the gearbox, is of the plunger type and is operated by the reverse gear selector mechanism.

Overdrive Switch (Gearbox Operated)

The overdrive switch is mounted on the gear box top cover forward of the gear change turret assembly. The switch is of the plunger type and is only operative in top gear, when the manual switch on the dashboard is in the 'on position'.

Windscreen Wipers

The windscreen wiper motor and gearbox are mounted on the electrical control panel in the battery bay. A cable rack transmits motion to two wheel boxes beneath the scuttle facia, which operates the wiper blades. No adjustment or lubrication is necessary as all parts are packed with lubricant on assembly.

The windscreen wiper control knob (Marked W) is on the right hand wide of the instrument panel and has three positions as follows:

1. Fast 2. Slow. 3. Parking.

A thermostatic cut out switch is built into the motor to prevent overheating. However in order to avoid excessive operation of the switch the fast speed (1) should only be used during heavy rain, and never in snow, or on a drying windscreen.

Horns

The push button in the centre of the steering wheel energises a solenoid relay switch situated on the inside of the right hand wheel fairing to the rear of the radiator. The horns on early cars are fitted one on each side between the radiator core and the front grille, and on later cars one above the other on the left hand side.

Instrument Panel

The instrument panel see Figs.214 & 215,is mounted on brackets extending from the rear of the scuttle mounting and is screened by a detachable hood to eliminate reflection.

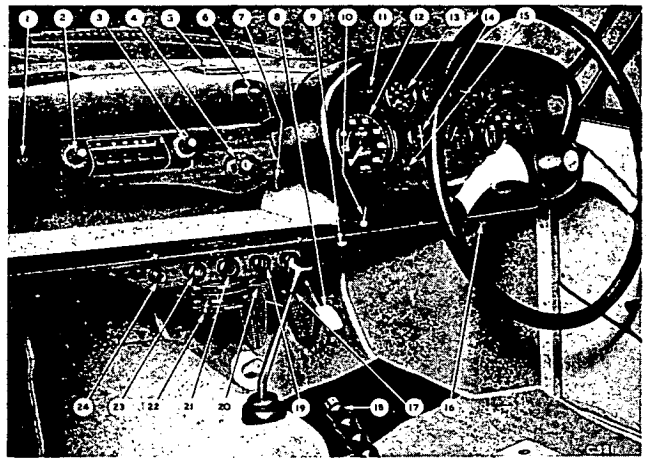


Fig. 214. Instrument panel and controls

The panel light rheostat (Marked L) controls four 2.2 watt bulbs. The bulbs being positioned as follows:- one behind both the speedometer and rev. counter, the remaining two being shared by the remaining instruments.

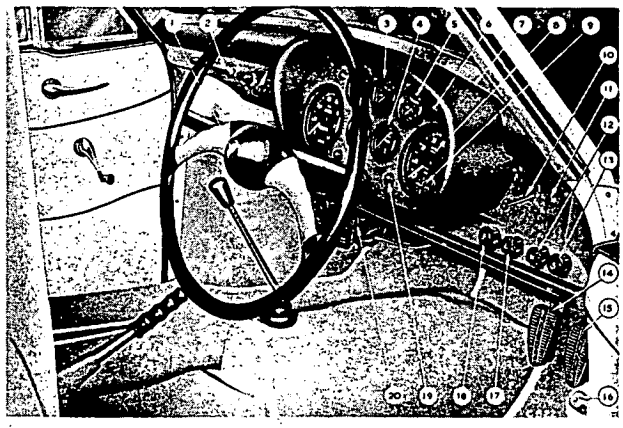


Fig. 215. Instrument panel and controls

Radio

Radio is an optional fitment, provision however is made for the installation of the HMV Radiomobile or Ekco together with speakers and aerial. The HMV radio assembly comprises the control unit and power amplifier. The control unit is mounted into the left hand side of the dashboard, the power amplifier being situated under the bonnet in the left hand scuttle compartment.

The Ekco installation uses a power pack in place of the power amplifier unit, this being the basic difference between the two assemblies.

Two speakers are used, one fitted well forward in the roof and a second in the rear squab shelf.

The aerial is located centrally on the roof just aft of the windscreen.

The aerial and speakers leads are fitted to all cars during manufacture.

Flashers

The flasher type direction indicators are housed in the multi-purpose side and rear lamps and are controlled by the indicator switch mounted centrally on the scuttle panel and is connected by an extension rod to a control on the dashboard see Fig.195. The switch is connected through a flasher unit and relay housed in the battery bay, to the side and rear lamps. The length of time that the indicator is in operation is controlled by an automatic time switch. When the direction indicator is in operation a warning light on the instrument panel is energised.

Headlamps

Each headlamp incorporates a Lucas Light Unit which comprises a reflector and front glass assembly with a mounting flange by which it is attached to a body shell. The body shell is secured to the front wing aperture by screws. The twin filament prefocus bulb is secured in its holder by a backshell which engages the bayonet socket of the bulb holder and also provides the two electrical contacts for the bulb, a safety clip engages slots in the bulb holder to retain the bulb when the backshell is removed see Fig.197.

Side Lamps

Each sidelamp housing is built into the front wing the cover glass and integral rim protruding beyond the wing surface. The lamp is fitted with a twin filament bulb, 6 watt for the side lamp and 21 watt for the 'Flasher' direction indicator. The glass and rim is retained by a bayonet type fixing See Fig.216.

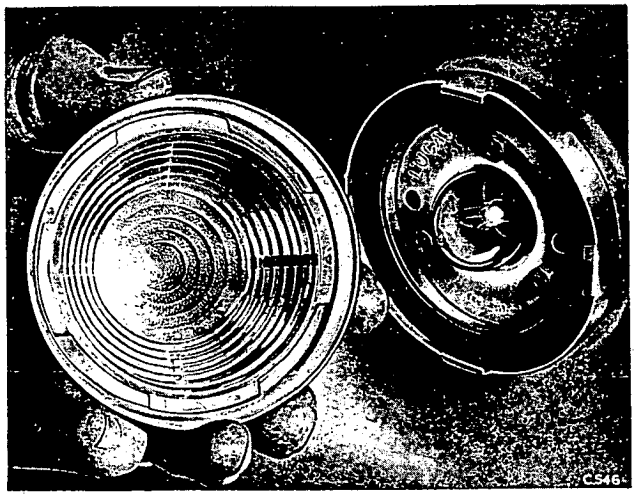


Fig. 216. Sidelamp

Stop Rear and Direction Lamps and Reflectors

The multi-purpose lamps each incorporate a twin filament bulb, 6 watt for the rear light and 21 watt for the flasher and stop light. The regulation type reflector is incorporated within the moulded glass cover. The glass and rim is retained by a bayonet type fixing see Fig.217.

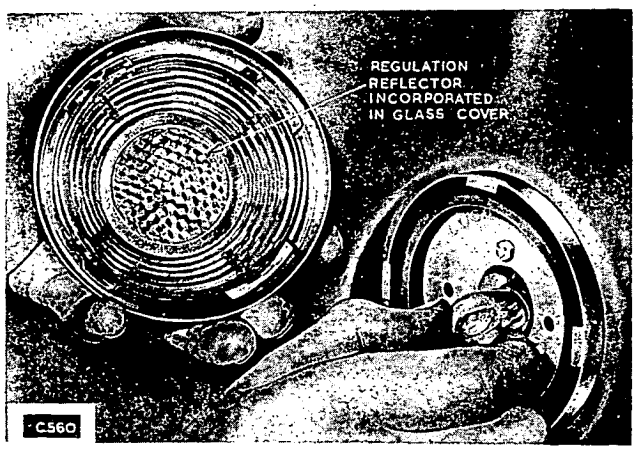


Fig. 217. Stop, rear and direction lamps and reflectors

Rear Number Plate Illumination and Reverse Lamp

Mounted on the Boot Door this lamp houses three bulbs, the two outer bulbs each of 4 watt illuminate the number plate, and the centre 21 watt bulb is mounted behind a translucent (white glass) indicates rearward movement of the car. See Fig.218.

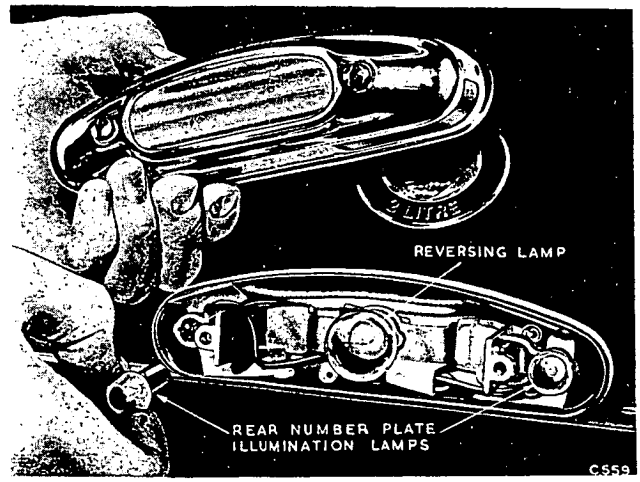


Fig. 218. Rear number plate and reverse lamp

Map Reading Lamp

This lamp is situated beneath the facia panel over the parcel shelf and is controlled by a push switch in the facia panel to the left of the radio control unit.

Fog Lamp

These lamps are mounted on brackets beneath the front bumper and are controlled by a push/pull switch (marked F).

Spot Lamp

The spot light is mounted in the radiator cowl entry, it comprises a detachable light unit and back shell and is controlled by a push/pull switch (marked S).

Inspection Lamp

The 'Minalite' type inspection lamp is housed in the right side bulkhead compartment beneath the bonnet. When the lamp is connected to the inspection lamp/trickle charger socket the base becomes magnetic and the lamp will therefore adhere to any ferrous metal surface.

Inspection Lamp/Trickle Charger Socket

The electrical supply/feed socket see Fig.201 is in direct electrical contact with the battery, current can be drawn from the battery, or supplied to it from a trickle charger.

Dipper Switch

The dipping switch is mounted on the toeboard to the rear of the brake and clutch pedal, when depressed will raise or dip the headlamp beam.

Boot Lamp

The boot lamp on early cars is wired in circuit with the side lamps, a micro switch causes the lamp to light when the door is opened. On later models the lamp is wired in direct circuit and will light independant of the side lamps.

Warning Lamps

Ignition Warning Lamp

This is situated on the bottom of the instrument panel to the left of the steering column. The bulb is fitted behind the amber glass and comes into operation when the ignition is switched 'ON'.

Head Lamp Warning Lamp

This is situated on the top left hand side of the steering column. The bulb is fitted behind a red glass and comes into operation when headlamps are on main beam.

Fuel Warning Lamp

This is situated on the bottom right hand side of the steering column. The bulb is fitted behind a blue glass and only appears when the petrol reserve switch and ignition is switched on.

Direction Indicator Warning Lamps

This is situated on the top right hand side of the steering column. The bulb is fitted behind a green glass and winks simultaneously with the flashing indicators.

Overdrive Switch (Manual) (See Fig.219.)

This is mounted in a panel to the right of the instrument panel. Overdrive is only incorporated in top gear, the switch is self cancelling when changing down from top gear.

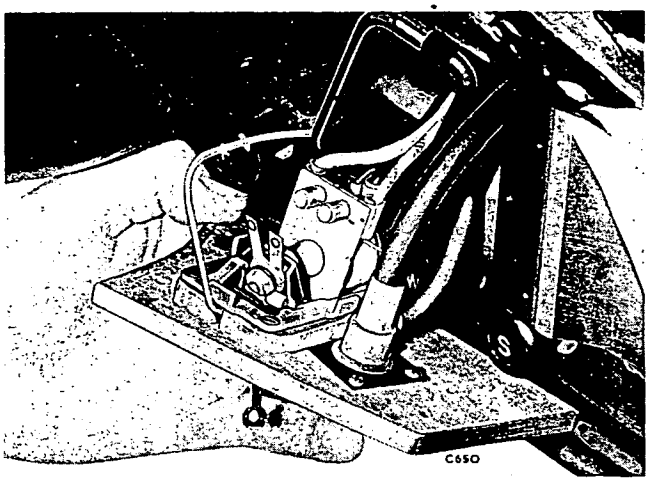


Fig. 219. Overdrive switch (manual)

Servicing

Starter.	As for Type 404.
Care of the Battery.	As for Type 404.
Brake Light Switch.	As for Type 404.
Windscreen Wiper Motor.	As for Type 404.

Horns

Adjustment and Refitting.

The horns will give long periods of service without attention under normal circumstances. If however the performance of one or both horns becomes uncertain, make sure that some outside source is not the cause of the trouble ie, a loose connection, blown fuse or any loose parts in the vicinity of the horns which will vibrate when the horn is energised.

The adjustment provided in each horn will take up wear in the moving parts but will not affect the noise pitch.

To adjust the horns the following procedure should be carried out:-

Early type cars.

1. Remove the bonnet.
2. Remove the central fixing screw and domed cover from one horn and detach the supply lead. Care to be taken not to short circuit the wiring.
3. Remove the central fixing screw and domed cover from the other horn and then remove the cover securing bracket by springing it from its mounting.
4. Slacken the locknut of the fixed contact and turn the adjusting nut until the contacts are just separate, see Fig.203.
5. The correct initial setting is when the horn just fails to sound when the button is depressed, then turn the adjusting screw 1/2 turn in the opposite direction, then lock in position. Test the horn. If it fails to sound correctly re-assemble it and return it for examination to a Lucas agent.
6. If satisfactory the procedure for refitting is reversed.

Intermediate type cars.

To remove the central fixing screw and domed cover from the right hand side horn, first unscrew the securing clip and remove the inlet cowl from the blower unit. The adjustment for horns is then as stated for early type cars.

Later type cars.

Due to their location it will be necessary to remove the horns from their mounting in the following manner.

1. Remove the bonnet.
2. Disconnect the Battery.
3. Release the two attachment nuts and bolts from each of the horn mountings.
4. Detach the supply lead.
5. Test and adjust the horn by coupling a supply lead to a spare battery.
6. If satisfactory the procedure for refitting is reversed.

Radiomobile Radio. Ekco Radio. Front Speaker. Aerial. Removing and Refitting.	As for Type 404.

Rear Speaker

Removing and Refitting.

To remove the heavy duty speaker from the rear squab, disconnect the battery from within the boot compartment turn back the felt masking the speaker. Release the four screws securing the speaker to the squab shelf, lower the speaker and detach the leads.

For refitting the procedure is reversed care being taken that the dust screen is positioned immediately behind the speaker grille.

Instruments

Removing and Refitting. As for later Type 404.

Instrument Panel Lamps and Warning Lamp Bulbs.

Removing and Refitting. As for later Type 404.

Headlamp, Spotlamp and Fog Lamps.

Replacing a Bulb and setting the beam. As for later Type 404.

Direction Indicator Switch.

Removing and Refitting. As for Type 404.

Replacing Bulbs

Stop, Rear and Direction Indicator Lamps. Side and Direction Indicator Lamps

To replace this bulb push in and twist the cover glass anticlockwise using the finger grip moulded on the cover glass, withdraw the glass see Fig. 216 and Fig. 217 the bulb is designed to permit correct fitment only.

Rear Number Plate Illumination and Reverse Lamp

Remove the two screws securing the cover, remove the cover to expose the bulbs see Fig.218.

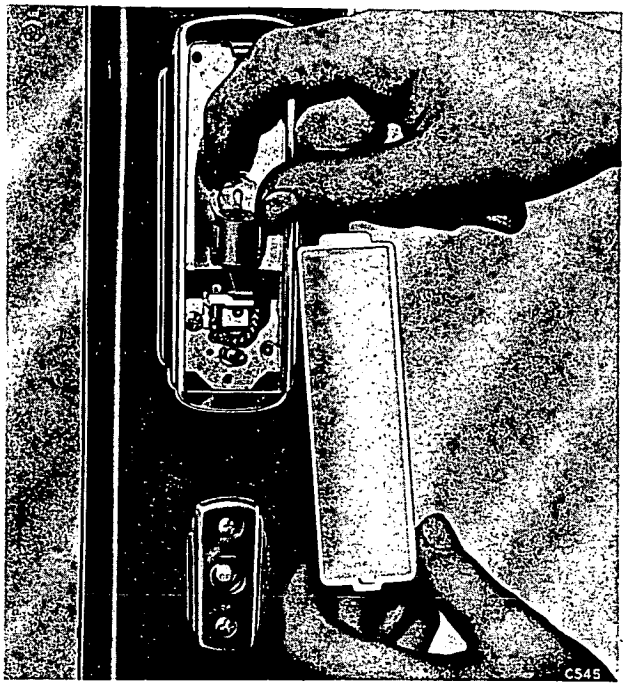


Fig. 220. Replacing bulb - interior lamp

Interior Lamp

Remove the plastic 'snap-on' cover to expose the bulb, then pull the bulb from the clip see Fig.220.

Map Reading Lamp

As for Type 404.

Boot Illumination Lamp

Remove the two screws securing the rim, and cover glass to expose the bulb.

Body

List of Contents

List of Contents

Body

Body

Body Structure

General

The basic body structure comprises of three sub-sections which are assembled to the chassis frame, the complete assembly becoming integral.

These sub-sections are the front and rear metal steel structures and a wood canopy. The wood is mainly ash and in most instances it is laminated.

Fig.221 shows the front view of the structure and Fig.222 shows a R.H. side view of the front structure. These front views are applicable to the Type 404 and Type 405 cars.

Fig.223 shows the rear view of the Type 404 Car structure and Fig.224 shows the rear view of the Type 405 structure.

Panelling

The aluminium alloy panels are made up of various sections as shown in Figs.225, 226, 227 and 228.

These sections can be obtained individually as spares or in assemblies which should be clearly stated when ordering.

During manufacture strips are cut from the actual material for welding rod and 'Uniflux' is used as a flux.

The joins in the panels should be fitted before welding so that no tension is used to connect them. If the joins are strained together there is a likelihood that they will crack or separate after dressing the surface.

Wing Stowage Compartments

To the rear of each front wheel arch is a compartment for stowage purposes. The left hand compartment houses the spare wheel while the right hand side houses the battery.

Each compartments hinged valance is of light alloy with spring loaded hinges which steady the valance in the fully open position Fig.229.

On later Type 404 Cars and on all Type 405 Cars the valance is fastened by a toggle fastener and a safety catch is fitted to the rear, see Fig.230.

Replacements

In the event of damage a complete valance panel is supplied, fitted with its stiffeners and ready for the aperture.

Valance Door Assembly Fig.231.

Three different methods for locking the valance door have been used on Type 404 Cars. The early method is a cable release operated from inside the car, the intermediate is a budget lock operated with a standard squared key, the later method is by toggle fastener on the lower edge. All Type 405 Cars have the later toggle fastener.

The valance doors can be detached by opening to the full extent, detaching the tension springs and removing the screws attaching the hinges to the panel.

In the event of hinges requiring replacement the rear hinges are supplied fully drilled and ready to screw into place. The front hinges, however, are supplied drilled on the body location but are not drilled or set (joggled) for the valance location. The joggle would have to be made to suit the body and valance locations and the existing holes in the valance scribed through to give the hole drilling positions.

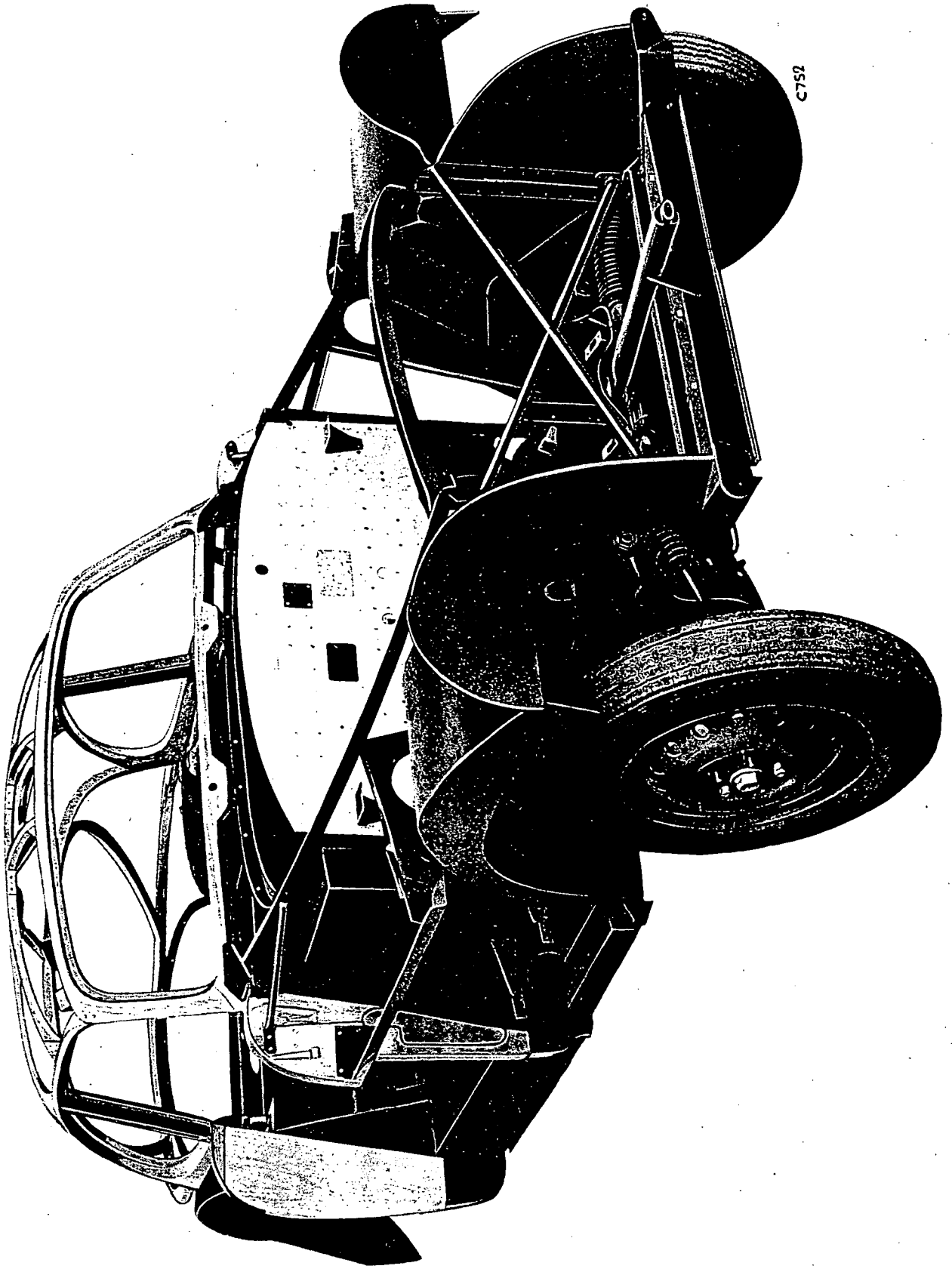


Fig. 221. Type 404 body structure - front view

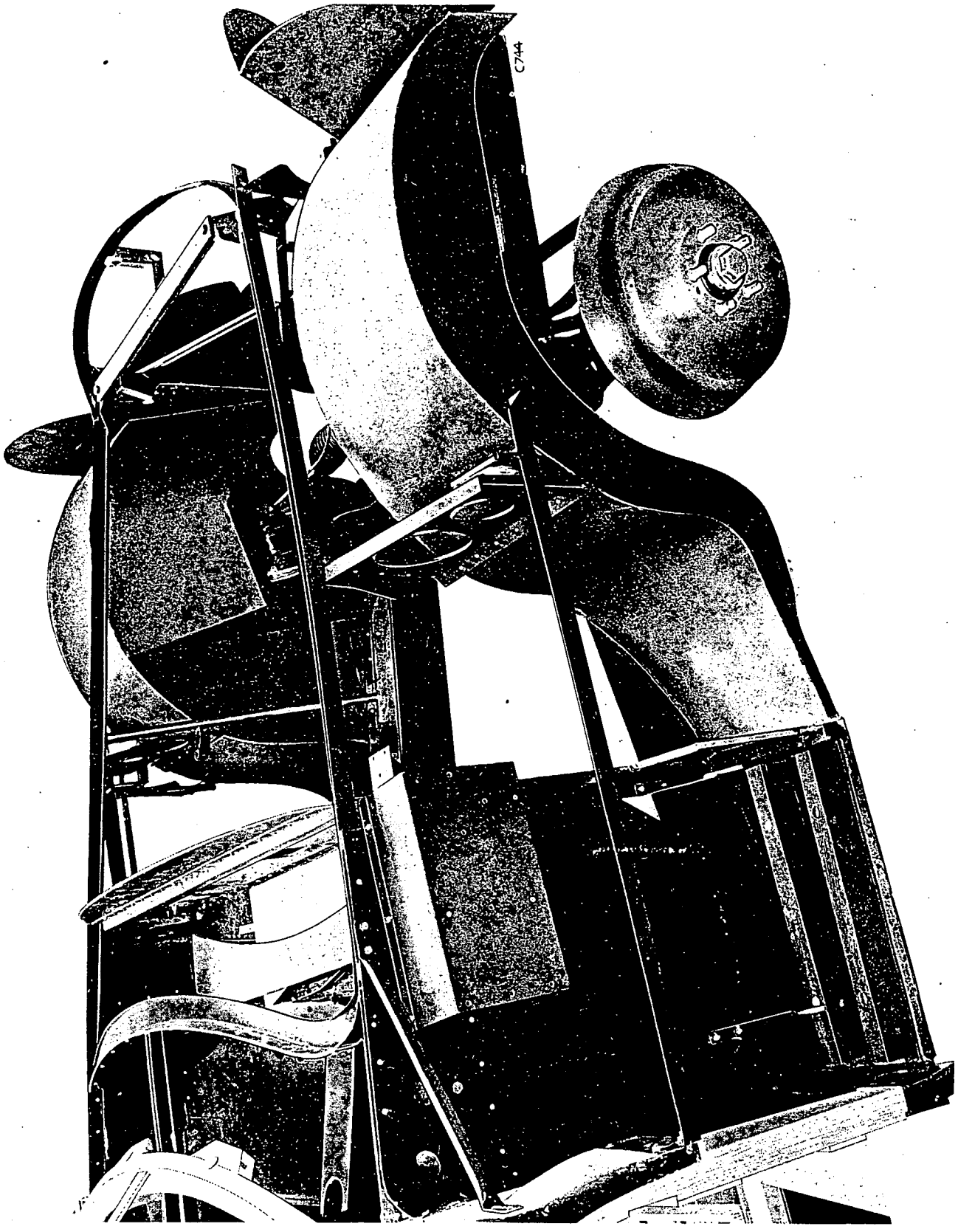


Fig. 222. Body structure - front R.H.

Fig. 223. Body structure - rear - Type 404

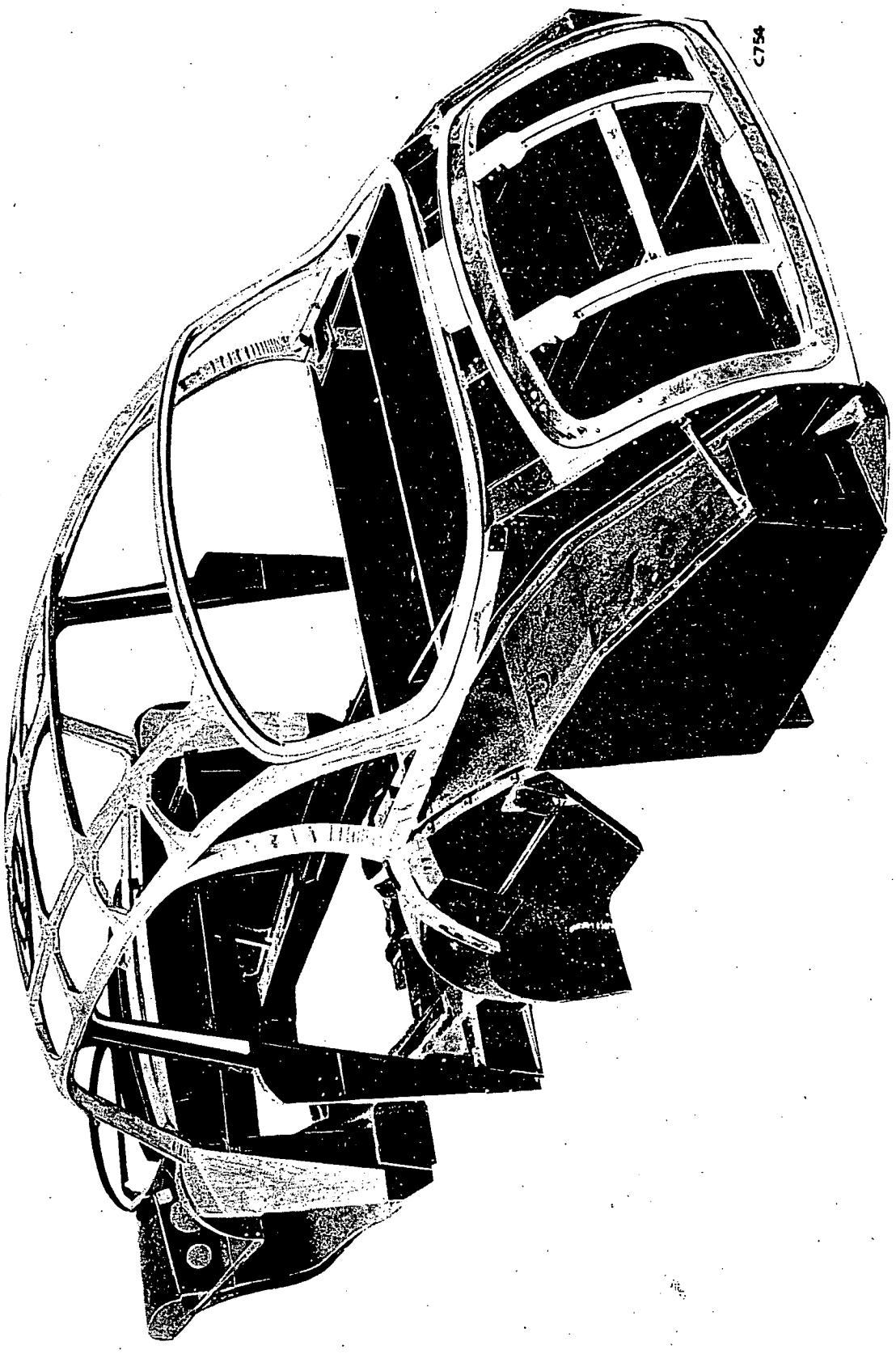


Fig. 224. Body structure - rear - Type 405

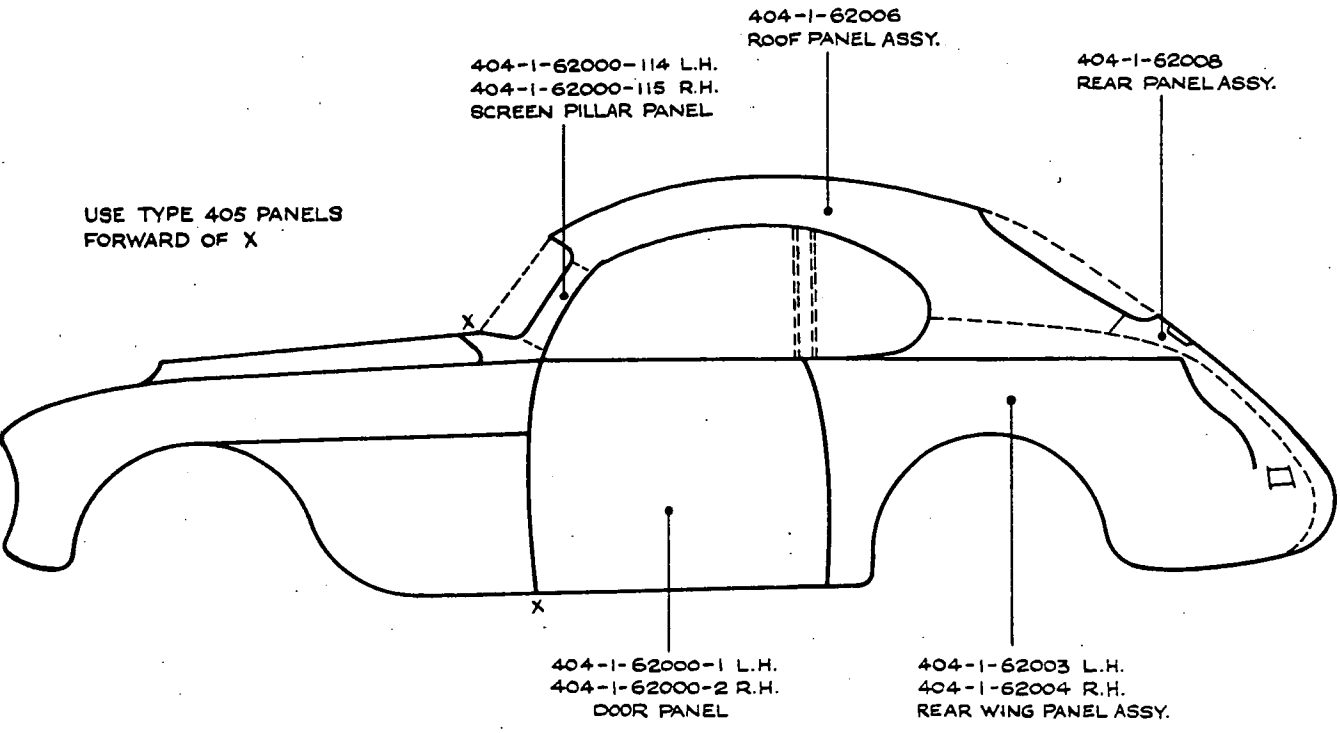


Fig. 225. Panelling - side view - Type 404

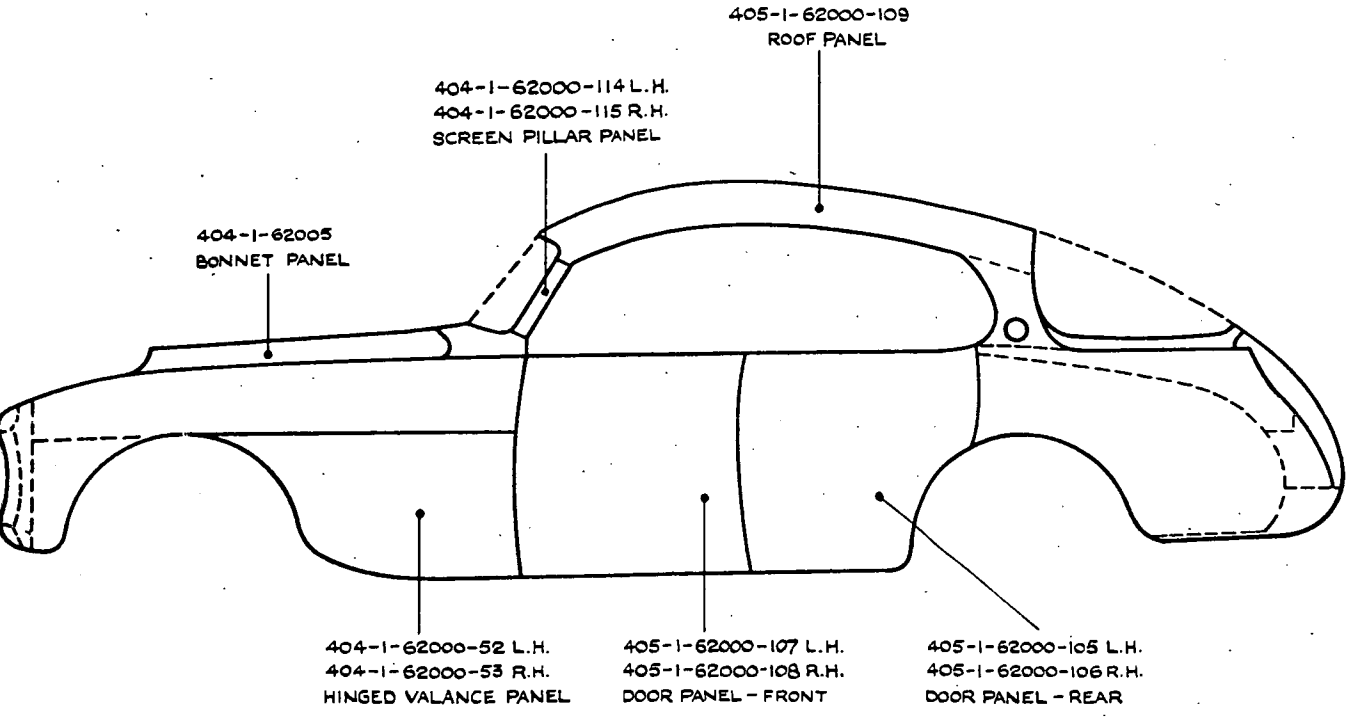


Fig. 226. Panelling - side view - Type 405

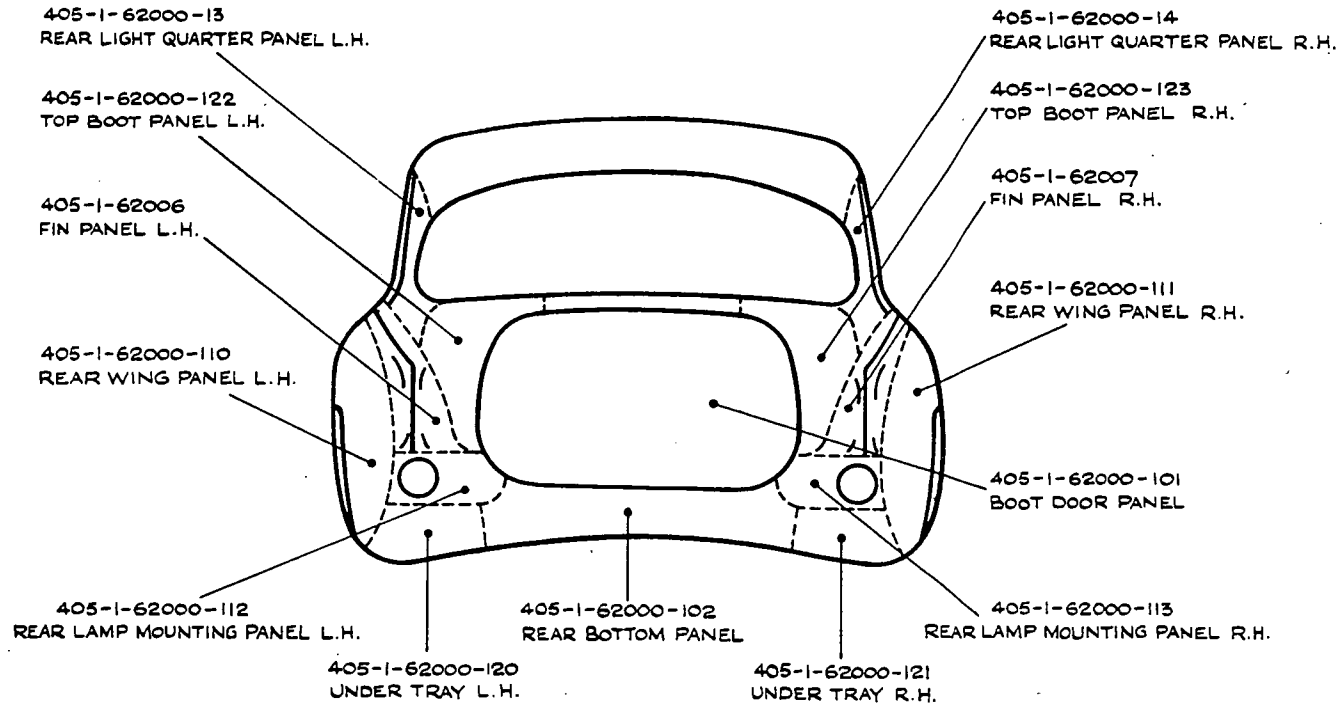


Fig. 227. Panelling - rear view - Type 405

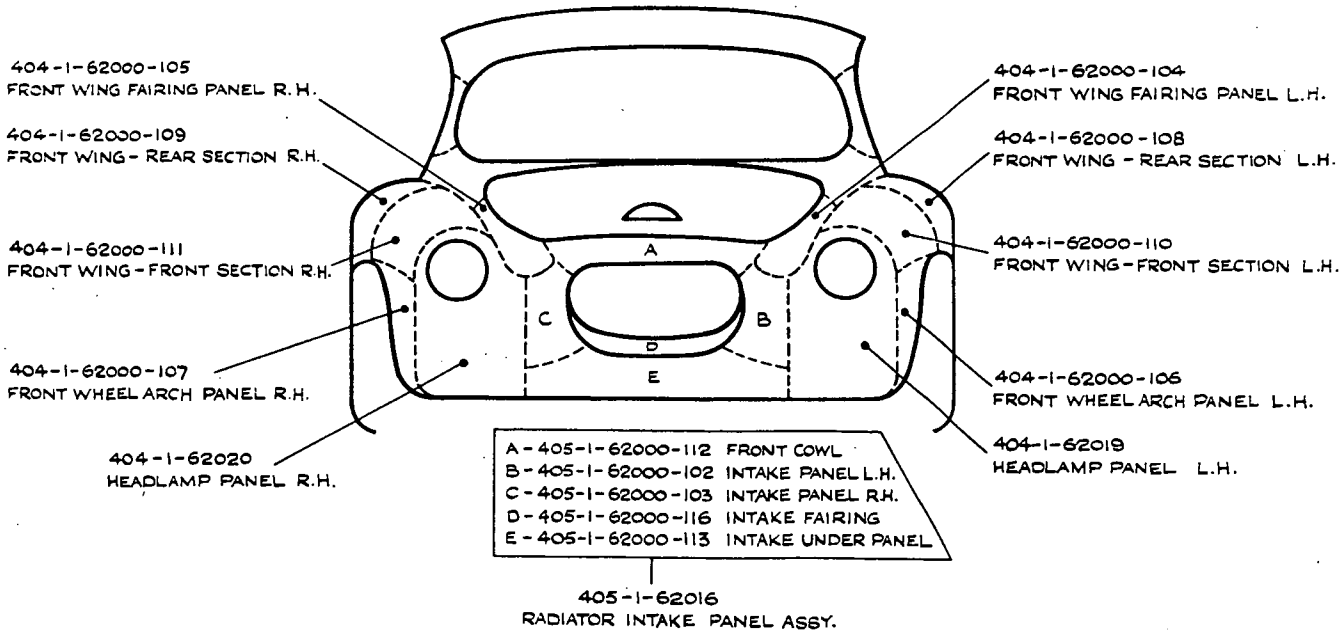


Fig. 228. Panelling - front view - Types 404-405

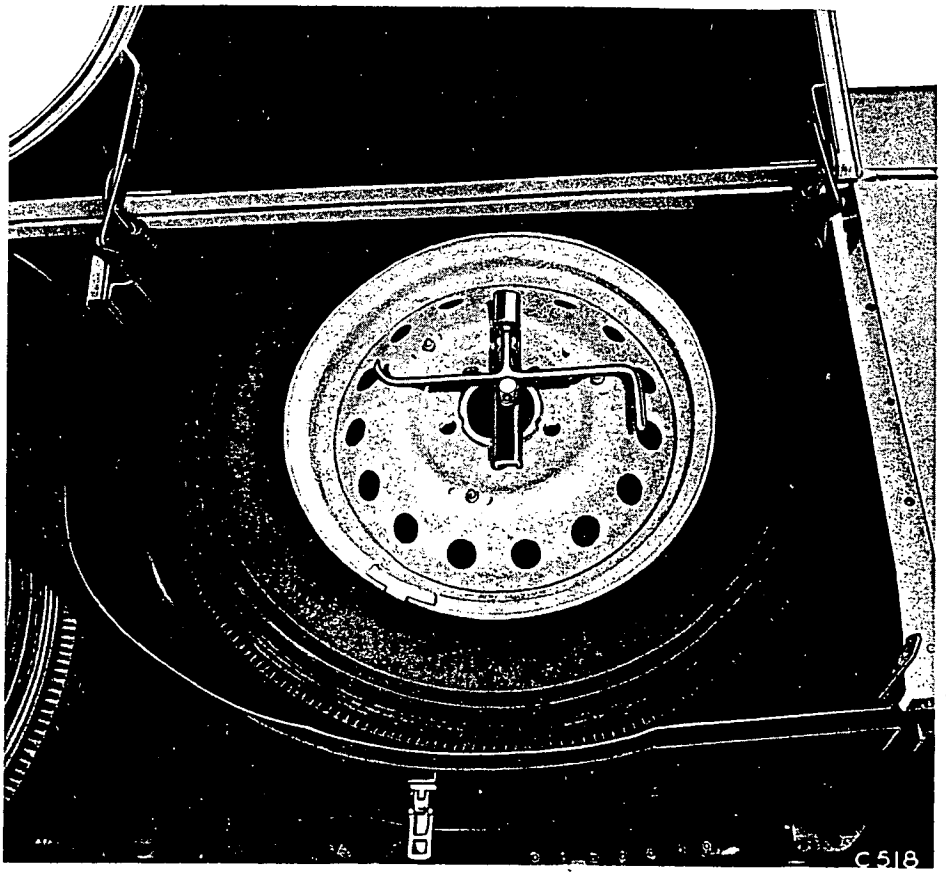


Fig. 229. Wing valance

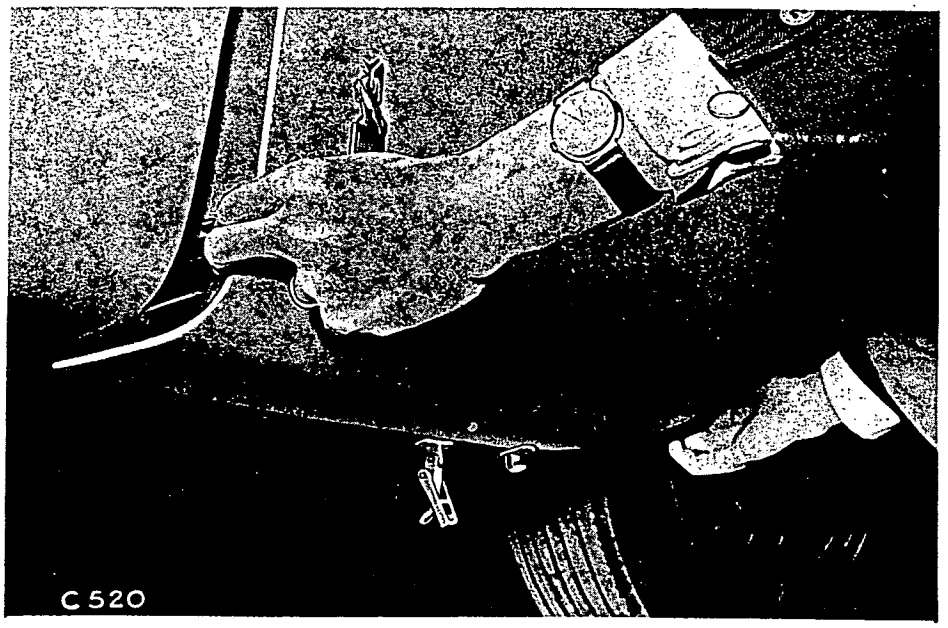
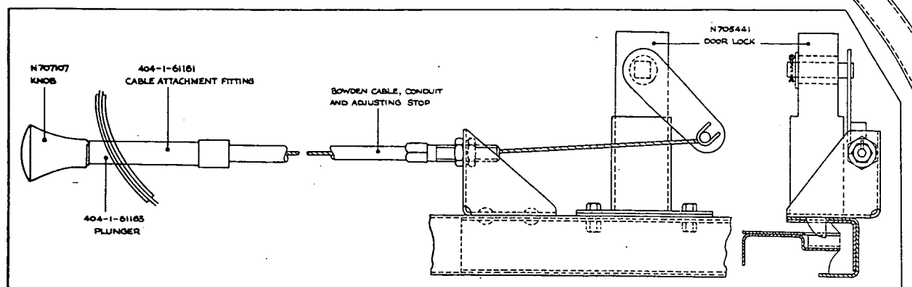
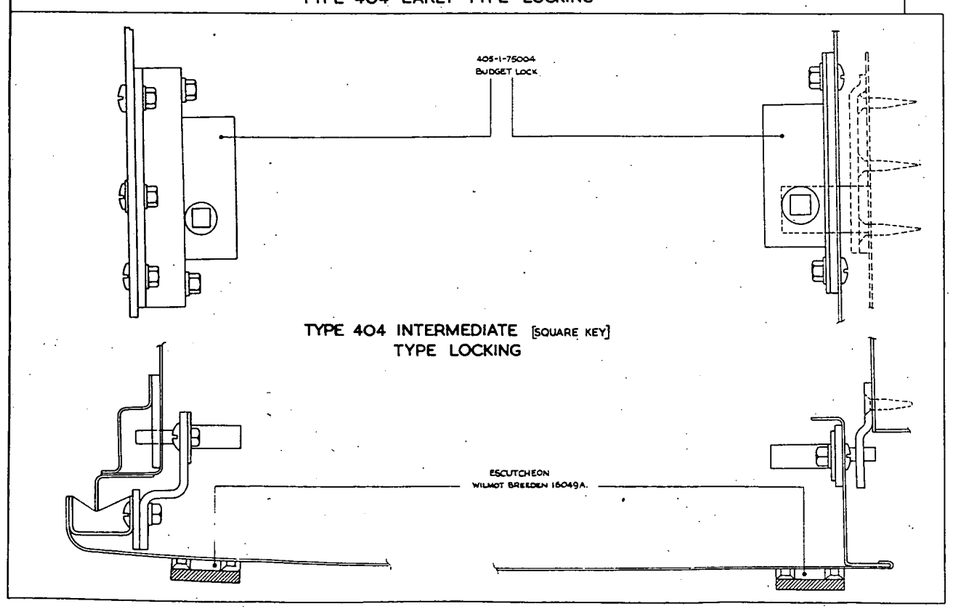


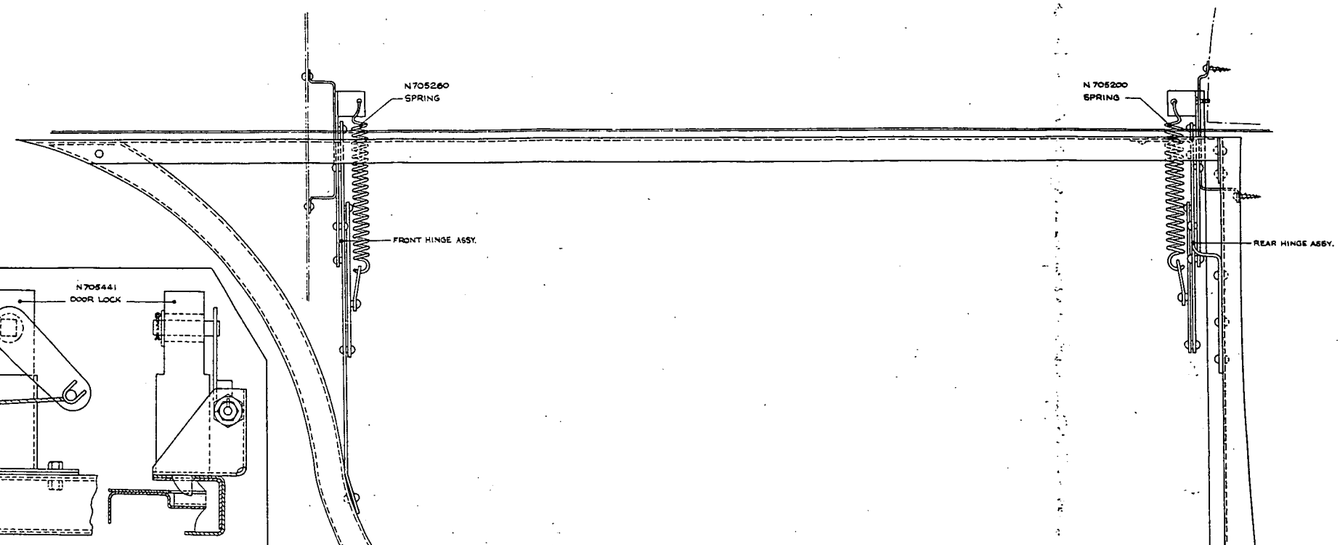
Fig. 230. Wing valance safety catch

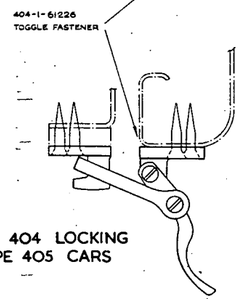


TYPE 404 EARLY TYPE LOCKING

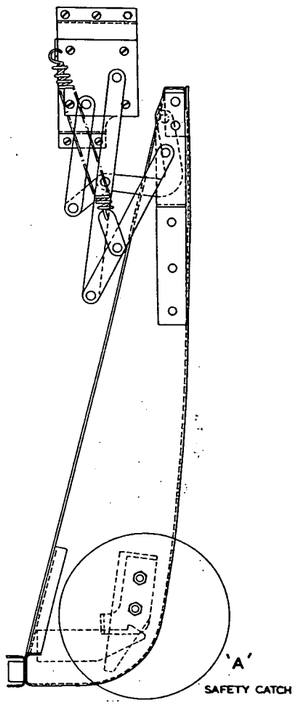


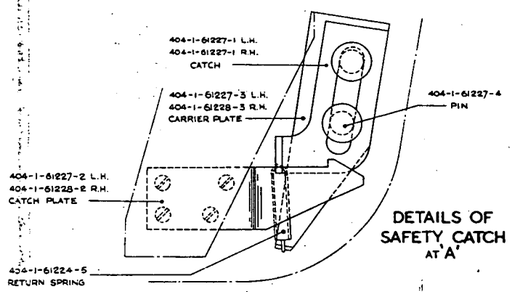
TYPE 404 INTERMEDIATE [SQUARE KEY]
TYPE LOCKING



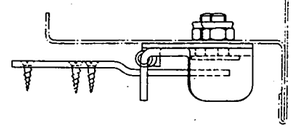


LATER TYPE 404 LOCKING
AND ALL TYPE 405 CARS





DETAILS OF
SAFETY CATCH
AT 'A'

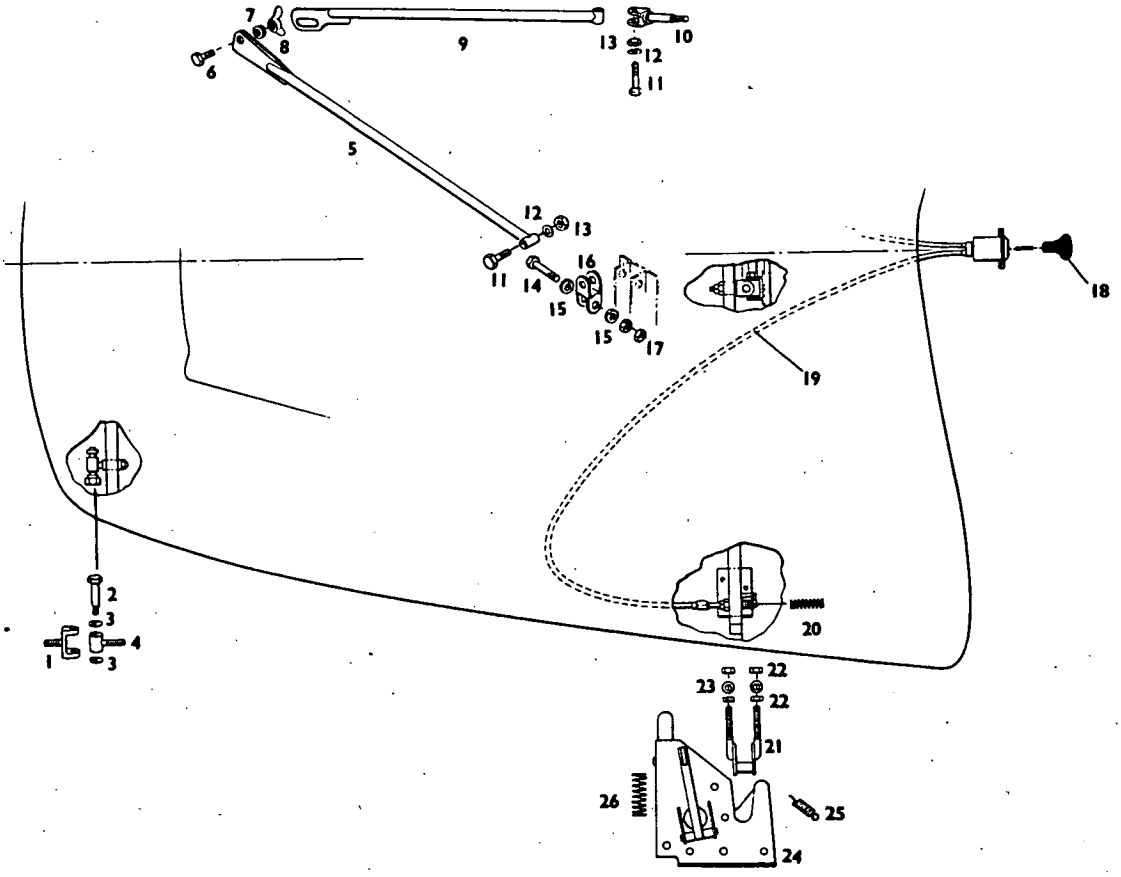


HINGED VALANCE [COMPLETE]

Fig. 231. Wing door assembly

TYPE 405. BONNET LOCKING - HINGE & STAY.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-71023	1	Fork End	2	AGS.586/D	15	Double Spring Washer	2
404-1-71024	2	Bolt	2	404-1-71019	16	Universal Bracket	1
AS 470G	3	Washer	8	-	17	Locknut ¼" BSF	1
404-1-71022	4	Hinge Bearing	2	N.707107	18	Operating Knob	1
404-1-71018	5	Bonnet Stay - Short	1	404-1-71010	19	Cable and Fittings complete	2
FS.104/7D	6	Setscrew ¼" BSF	1	404-1-71012	20	Spring	2
AGS.163/D	7	Double Spring Washer	1	404-1-71021	21	Bonnet Catch	2
-	8	Wing Nut ¼" BSF	1	FN.105/K	22	Nut 5/16 " BSF	8
404-1-71017	9	Bonnet Stay - Long	1	-	23	Washer 5/16" Shakeproof	8
404-1-71020	10	Fork End	1	404-1-71001	24	Bonnet Lock LH	1
FB.104/10D	11	Bolt ¼" BSF 1¼" long	1	404-1-71002	-	Bonnet Lock RH	1
-	12	Washer ¼" Shakeproof	1	-	25	Tension Spring for Swinging Catch - Bonnet Lock	2
FN.104/K	13	Nut ¼" BSF	1	-	26	Compression Spring for Square Plunger - Bonnet Lock	2
FB.104/12D	14	Bolt ¼" BSF 1½" long	1				



Bonnet

The bonnet Fig.232 is mainly constructed of aluminium with steel cross tubes. It has adjustable hinges at the front and locking catches at the rear which are cable operated and released by a press button in the centre lower edge of the dashboard.

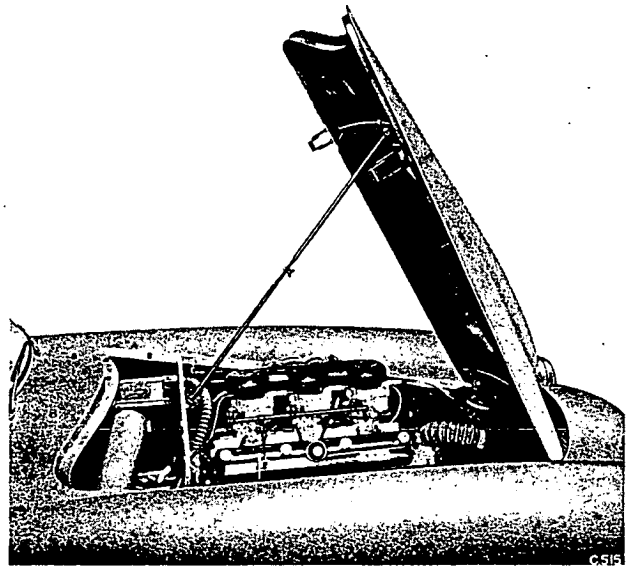


Fig. 232. Bonnet

Removing and Refitting the Bonnet

Press the release knob, raise the bonnet fully and support with the stay.

Unscrew the two front hinge bolts but do not remove them. With assistance, support the bonnet and disconnect the stay, then withdraw the hinge bolts and lift the bonnet clear of the car.

To refit reverse the removing procedure. Some provision has been made at the hinge bearings for adjustment.

Bonnet Panel Assembly Fig.233.

During manufacture the bonnet panel is fitted to each individual car due to variations in the aperture. Replacement bonnet panels are therefore supplied untrimmed with the air intake finished but without the intake gauze fitted.

To Fit a Bonnet Panel

With the bonnet stops in position mark temporary centre lines on the car and bonnet panel and trim the panel to the aperture giving a clearance of 1/8 inch at the edges.

Fit the side angles, rear angle and front piece to the edges and trim the ends to fit neatly together. At the same time the cross tube assemblies should be trial fitted between the side angles to control the width. Spot weld the angles and front piece to the panel. Weld together the joints between the angles and front piece.

Position the cross tubes correctly to the dimensions given and drill and rivet them into position on the side angles. Fit the stiffeners to the front tube on the centre line and spot weld them to the panel.

Using the air intake gauze as a template drill the holes in the flange of the panel with a No.25 drill and secure the gauze with Parker Kalon screw and spire nuts.

Fit the bonnet catches and hinges both of which have adjustment for final setting.

Bonnet Lock Fig.234.

These parts need little attention except occasional cleaning and oiling. Adjustment is provided on the bonnet catches and on the cable to ensure that both sides lock and unlock together.

To close the bonnet, lower it to approximately nine inches of the scuttle and release it. Its own weight should be sufficient to lock it.

To adjust the catches release the lock nuts as shown in Fig.233 the cable adjustment being shown in Fig.235.

Replacing a Bonnet Release Cable

Should a cable be broken with the bonnet locked open the appropriate side valance and release the bonnet lock by reaching through into the engine compartment and pressing the release lever towards the bonnet lock.

Referring to Fig.235 unscrew the adjusters and disconnect the cables at the bonnet locks, at the same time retaining the return spring.

From beneath the dashboard, remove the two screws securing the stop plate at the rear of the plunger assembly and manipulate the cable nipples from the slots. If necessary remove any clips and withdraw the complete cable and conduit.

Prepare a new length of cable to correspond with the old and solder the appropriate nipple to one end only. Well lubricate the cable and pass it through the conduit. Solder the nipple to the other end.

Thread the completed cable through the scuttle, and beneath the dashboard, fit the ferrule housing and cable locking plate over the ends. Manipulate the nipples into their slots in the plunger housing and insert the two screws to retain this assembly.

At the other end, fit the return spring over the end and fit the nipple into the release lever. With the cable passing through the bonnet lock screw in the cable adjusters.

With the conduit clipped into position adjust the cables so that both bonnet locks open simultaneously.

Finally check with the bonnet that the locking and releasing is correct.

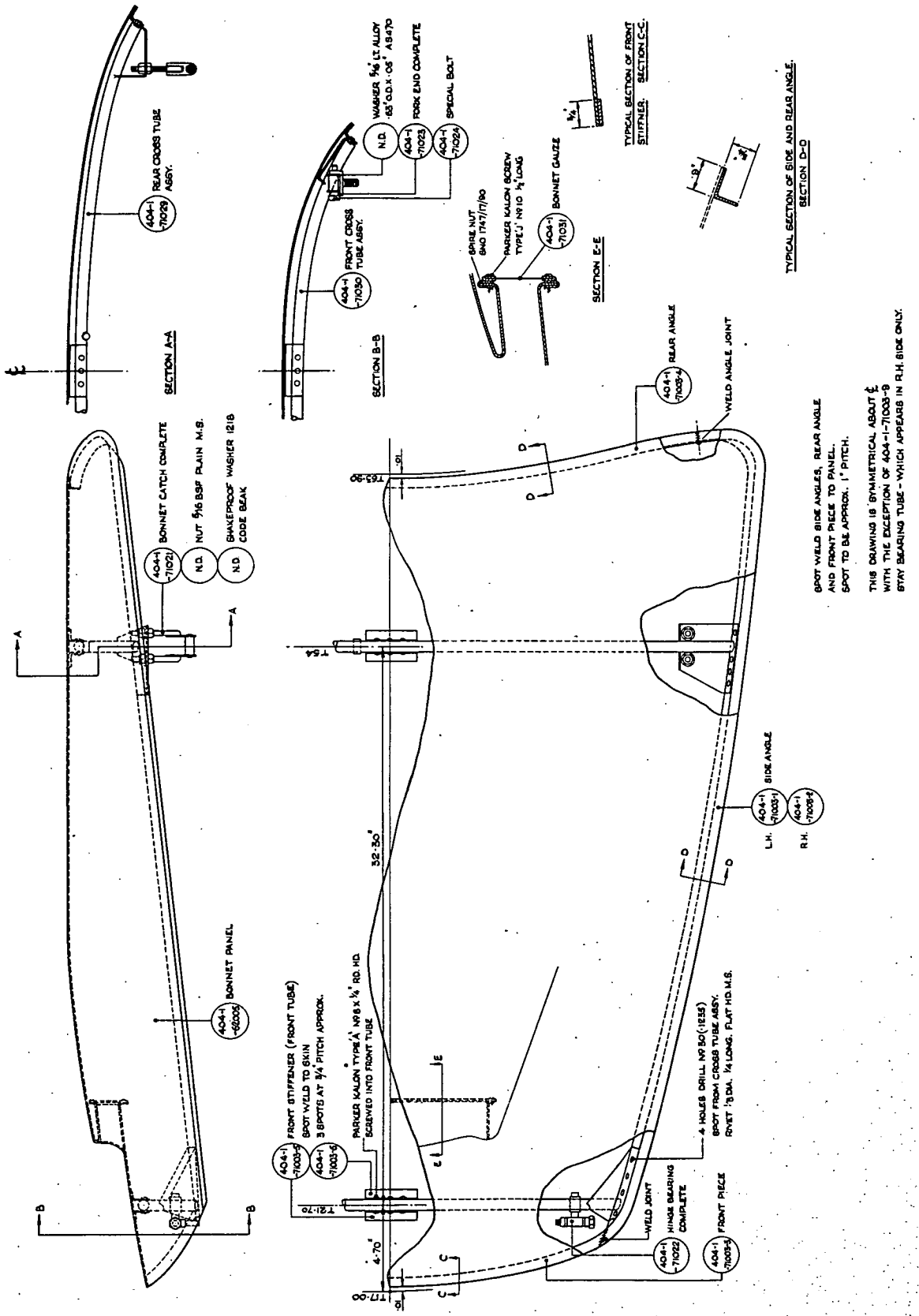


Fig. 233. Bonnet panel assembly

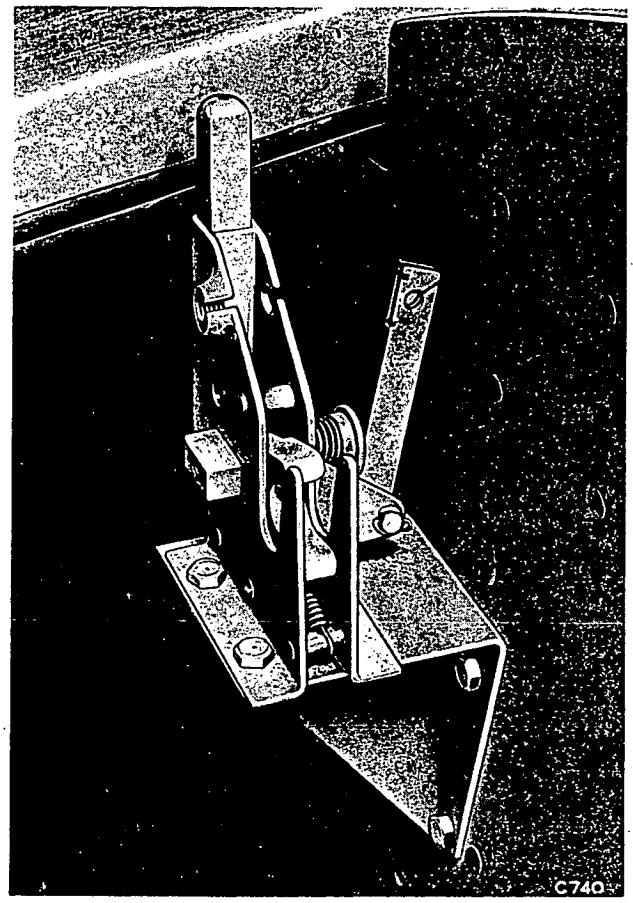


Fig. 234. Bonnet lock

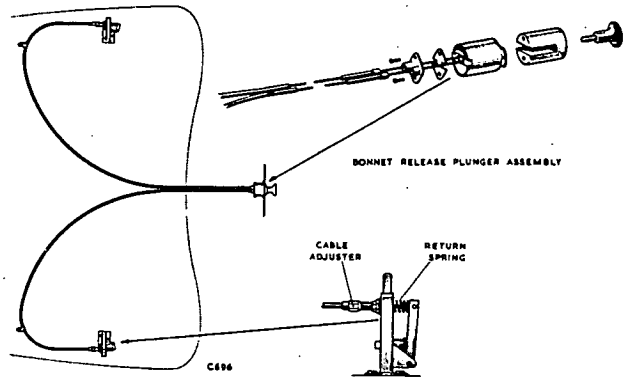
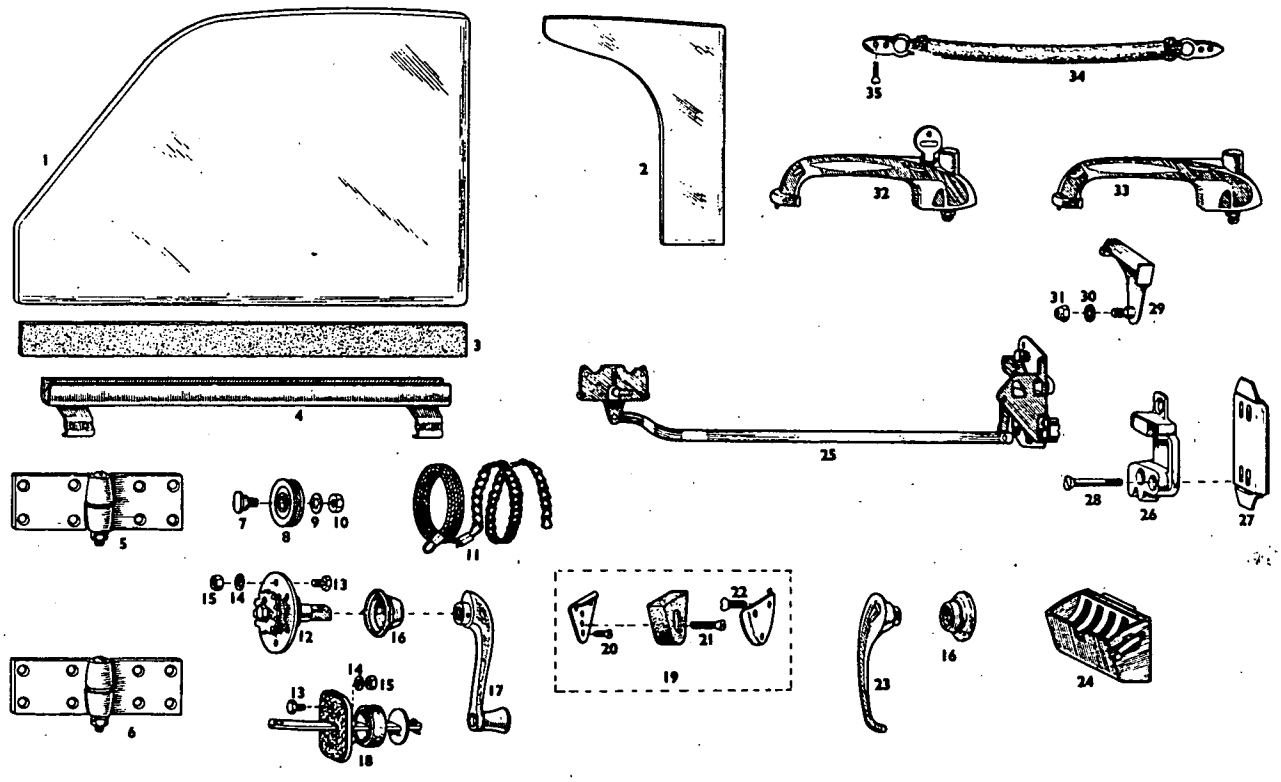


Fig. 235. Bonnet release mechanism

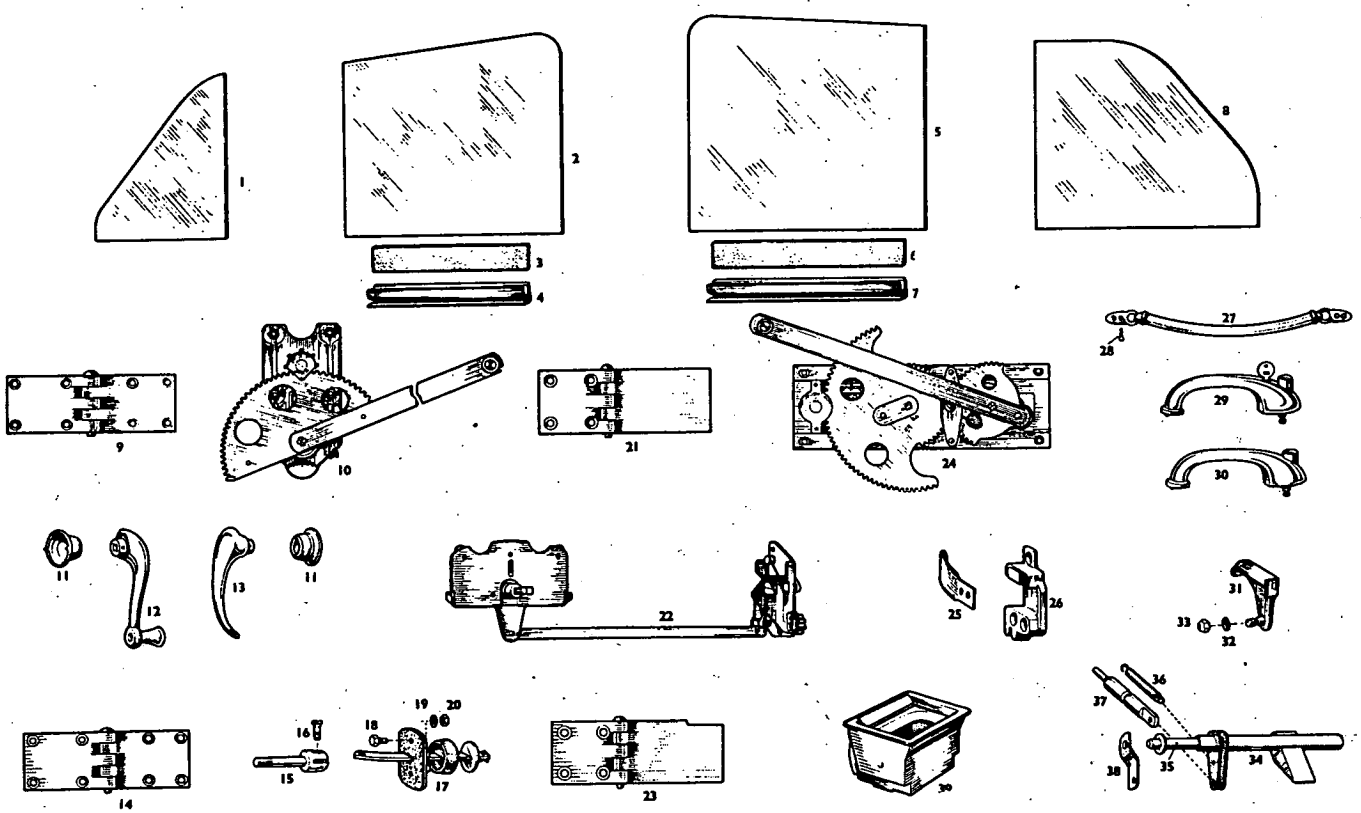
TYPE 404. DOOR FITTINGS.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-65008	1	Window Glass	2	404-1-65012	18	Door Check	2
404-1-65048	2	Draught Deflector - Perspex	2	N.592471	19	Door Buffer	2
-	3	Rubber Strip 2" x 1/16" x 28" long	2	-	20	Screw 4BA x 3/8 " long Csk. Hd.	6
404-1-65030	4	Window Glazing Channel	2	-	21	Screw 4BA x ¾" long . Raised Head - Chrome	4
404-1-65057	5	Door Hinge L.H. Top & Bottom (Chassis 2001 to 2029)	2	-	22	Screw - Phillips No.4 ½" long Type Z	6
				404-1-65017	23	Inside Door Handle Used on Chassis 2001 to 2036	2
404-1-65011	-	Door Hinge - Top - LH) Chassis 2030	1				
405-1-65012	-	Door Hinge - Top - RH) onwards	1	404-1-65083	-	Inside Door Handle Used on Chassis 2037 onwards	2
404-1-65058	6	Door Hinge RH - Top & Bottom (Chassis 2001 to 2029)	2	N.705624	24	Ashtray - Black - Interior only Used on Chassis 2001 to 2038	2
404-1-65071	-	Door Hinge - Bottom - LH) Chassis 2030	1				
405-1-65072	-	Door Hinge - Bottom - RH) onwards		404-1-65052	25	RR Lock and RC Mechanism LH	1
404-1-65029	7	Window Regulator Pin	10	404-1-65053	-	RR Lock and RC Mechanism RH	1
404-1-65028	8	Window Regulator Pulley	10	404-1-66005	26	Door Striker LH	1
-	9	Washer ¼" Shakeproof	10	404-1-66006	-	Door Striker RH	1
-	10	Nut ¼" ANF. Hex Plain	10	404-1-66027	27	Adjustable Backplate for Striker	2
404-1-65027	11	Window Regulator - Chain & Cable	2	-	28	Screw ¼" BSF x 2¼" long Csk. Hd.	6
404-1-65026	12	Clutch & Sprocket	2	404-1-65022	29	Swinging Link LH	1
-	13	Screw 2BA Hex. Hd ½" long	6	404-1-65023	-	Swinging Link RH	1
-	14	Washer ¼" dia. Shakeproof	6	-	30	Washer ¼" Plain	2
-	15	Nut 2BA Plain	6	-	31	Nut ¼ "BSF Aerotight EA1	2
N.705098	16	Escutcheon	2	404-1-65019	32	Push Button - Handle - Locking with 2 Keys	1
N.705093	17	Window Winding Handle complete Used on Chassis 2001 to 2036	2	404-1-65018	33	Push Button Handle - Plain	1
				404-1-65043	34	Door Pull	2
404-1-65084	-	Window Winding Handle complete Used on Chassis 2037 onwards	2	-	35	Screw 2BA x ¾" long Phillips Raised Head	8



TYPE 405. DOOR GLASS AND FITTINGS

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
405-1-65098	1	Ventilator Glass LH	1	405-1-65073	22	R.R. Lock and R.C. Mechanism. LH Front	1
405-1-65099	-	Ventilator Glass RH	1	405-1-65074	-	R.R. Lock and R.C. Mechanism. RH Front	1
405-1-65054	2	Front Drop Glass	2	405-1-65075	-	R.R. Lock and R.C. Mechanism. LH Rear	1
-	3	Glazing Rubber 2" wide 1/16" thick 1F long	2	405-1-65076	-	R.R. Lock and R.C. Mechanism. RH Rear	1
405-1-65017	4	Glazing Channel - Front	2	405-1-65063	23	Door Hinge LH - Bottom - Rear	1
405-1-65055	5	Rear Drop Glass	2	405-1-65064	-	Door Hinge RH - Bottom - Rear	1
-	6	Glazing Rubber 2" wide 1/16" thick 14" long	2	405-1-65015	24	Window Regulator LH - Rear	1
405-1-65018	7	Glazing Channel - Rear	2	405-1-65016	-	Window Regulator RH - Rear	1
405-1-65025-2	8	Quarter Light Glass	2	405-1-66019	25	Striker Ramp LH - Rear Door	1
405-1-65011	9	Door Hinge LH - Top - Front	1	405-1-66020	-	Striker Ramp RH - Rear Door	1
405-1-65012	-	Door Hinge RH - Top - Front	1	404-1-66005	26	Door Striker LH	2
405-1-64013	10	Window Regulator - Front - LH	1	404-1-66006	-	Door Striker RH	2
405-1-65014	-	Window Regulator - Front - RH	1	405-1-65020	27	Door Pull	4
N.705098	11	Escutcheon	8	-	28	Screw 2BA Raised Hd. Chromed - ¼" long	16
405-1-65084	12	Window Winding Handle	4	404-1-65019	29	Push Button Handle - Locking with 2 Keys	1
405-1-65083	13	Inside Door Handle	4	404-1-65018	30	Push Button Handle - Plain	3
405-1-65071	14	Door Hinge LH Bottom - Front	1	405-1-65069	31	Swinging Link LH - Front Door	1
405-1-65072	-	Door Hinge RH Bottom - Front	1	405-1-65070	-	Swinging Link RH - Front Door	1
404-1-61030	15	Anchor Bolt - Door Check Front Doors	2	-	32	Washer ¼" Plain	2
405-1-65107	-	Anchor Bolt - Door Check Rear Doors	2	-	33	Nut ¼" BSF Aerotight EA.1	2
-	16	Screw 2BA Csk. Hd. ½" long	4	405-1-65091	34	Swinging Link LH - Rear Door	1
404-1-65012	17	Door Check	4	405-1-65092	-	Swinging Link RH - Rear Door	1
-	18	Screw 2BA Hex Hd. ½" long	8	405-1-65094	35	Spindle	2
-	19	Washer 2BA Shakeproof	8	404-1-65087-1	36	Tension Spring	2
-	20	Nut 2BA	8	405-1-65106	37	Link	2
405-1-65067	21	Door Hinge LH - Top - Rear	1	405-1-65095	38	Spring Clip	2
405-1-65068	-	Door Hinge RH - Top - Rear	1	404-11-63083	39	Ashtray	3



Doors

The welded steel door frames are externally covered by an aluminium panel Fig.236 and Fig.237.

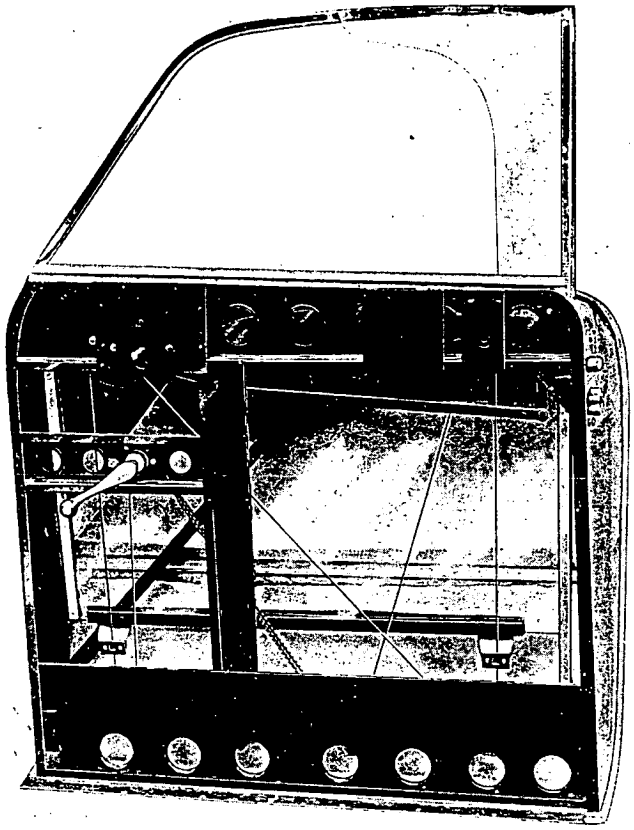


Fig. 236. Door structure - Type 404

Replacements

Due to variations in the door apertures during manufacture each door is individually fitted consequently a complete door cannot be supplied. In the event of damage it is recommended that the panel should be removed and the structure repaired and swung on its hinges. When this is satisfactory a new panel should be fitted to suit the aperture.

Door Locks

The locks are the rotary-ratchet type Fig.238 operated externally by a press button release and internally by a remote control door handle. As the door is closed, the teeth of the striker plate revolves the external star wheel of the door lock which in turn revolves a ratchet wheel inside the lock, therefore the door cannot be re-opened until the ratchet release is operated to allow the ratchet wheel to work in reverse. The passengers doors are locked by turning the internal handles downward to their full extent while the driver's door is locked with a key.

Servicing the Door Locks

The lock operated mechanism is thoroughly greased when initially assembled however it is well worth the trouble, should the lock fail to act smoothly, to strip down the door upholstery panel, clean away any rust caused by water seepage and well greasing and lubricating.

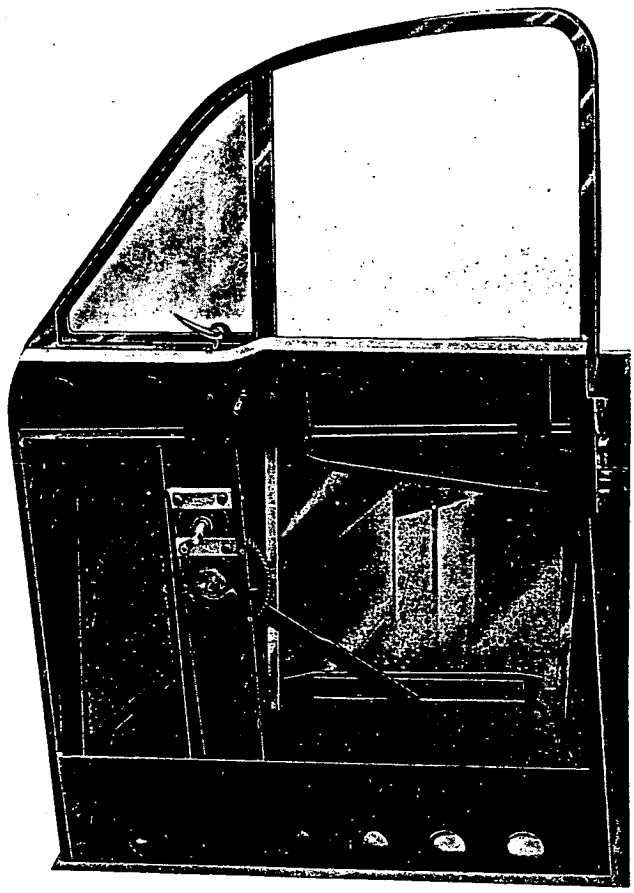


Fig. 237. Door structure - Type 405

Occasionally push back the spring-loaded bronze wedge of the door striker plate and lubricate with oil. Clean away any surplus.

In time it may become necessary to adjust the door catch and striker plate. To adjust, loosen the two securing screws sufficiently to allow the plate to be moved in or out or up and down.

Removing and Refitting Door Lock

Type 404 Cars.

Carry out the procedure for removing the window glass and then remove the window frame.

Remove the four screws securing the lock to the door face and the three screws attaching the remote control mechanism to the door structure and remove the complete assembly.

Check the condition and free operation of the swinging link Fig.239 which is secured by a 1/4 BSF Aerotight nut. After well greasing fit the mechanism back into the door and screw in and tighten the screws. Check thor-

oughly for freedom of movement and that the door will lock securely.

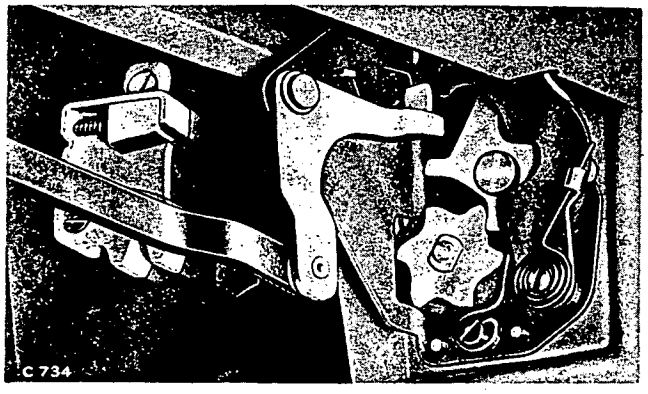


Fig. 238. Rotary door lock

Refit all the removed parts to the procedure given.

Removing and Refitting Door Lock

Type 405 Cars.

Front Doors

Remove the door upholstery panel, the wood sill, the window regulator and the window frame complete with glass.

Detach the remote control mounting plate from the door frame and remove the four screws securing the lock to the door frame. Remove the complete lock assembly.

Check the swinging link. See Type 404.

If a new door lock assembly is to be fitted the remote control mounting plate must be transferred.

To refit reverse the removal procedure. Well grease the mechanism.

Rear Doors

Remove the door upholstery panel, the door pull bracket, the channel rail with window toggle and sill.

Disconnect the link and spring from the swinging link. Remove the four screws securing the lock to the door face and the three screws securing the remote control to the door structure and take away the complete lock assembly.

Before refitting the lock assembly check that the swinging link Fig.239 is in order and lubricated. To remove this link lift and swing the spring clip away and withdraw the spindle complete.

To refit the parts reverse the removal procedure well greasing all parts.

Removing and Refitting External Door Handles

Type 404 and the Front Doors Only on Type 405

Remove the screw just inside the edge of the door, lift the handle and slide it clear of its front location. To remove the front location of the handle remove the upholstery panel.

New handles are supplied complete with the front location.

Type 405 Rear Doors

A hole is provided in the wheel arch of the door to insert a screwdriver to release the door handle. It is advisable however to remove the upholstery panel in order to prevent the screw from dropping into the bottom of the door when it is released. It would also be difficult to insert the screw without removing the panel.

Removing and Refitting Door Check Fig.240.

Remove the upholstery panel from the door. Remove the screw securing the flat bar of the door check to the fork end and from inside the door remove the two 2BA bolts and take out the door check.

Should the fork end need replacing it is bolted through the front door pillar and secured with a ferrule while on the rear doors it is secured by a nut which is made easily accessible by lifting the valance door.

When refitting check the full extent of the door opening before attaching the door upholstery panel. Should the door open too far, fit plain steel washers between the rubber buffer and the retaining split pin until the opening is satisfactory.

Removing and Refitting Door Upholstery

Press back the escutcheon on the door lock and window winder handles and push out the pin retaining the handle.

Remove the chromium embellishers at each edge of the door and level with the window sill and remove the metal finisher. Remove the door pull.

On Type 405 Cars remove the arm rest.

Remove the upholstery panel screws and lift away the panel.

To refit reverse the procedure.

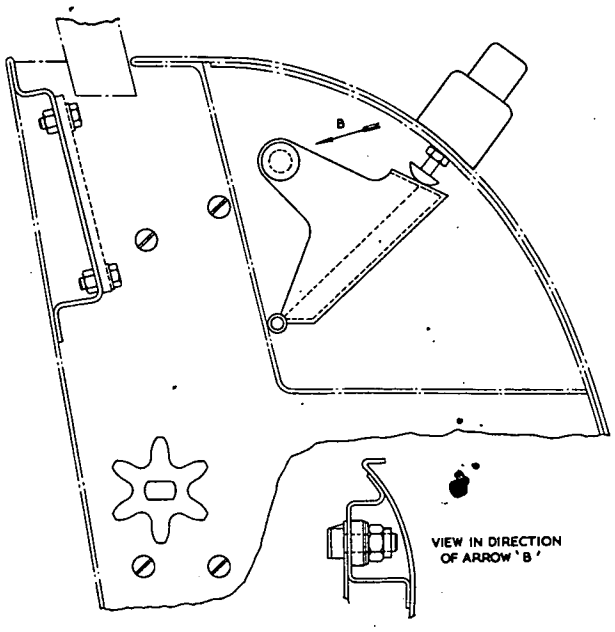
Window Winder

Type 404 Cars.

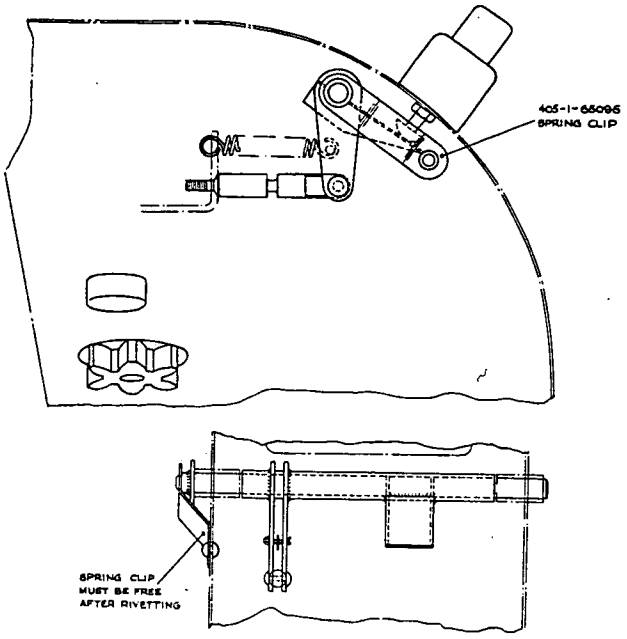
This is a cable and chain system as shown in Fig.236.

To Fit a Winder Cable

Remove the door upholstery and lower the window to the stops.



SWINGING LINK
TYPE 404 AND 405
FRONT DOORS



SWINGING LINK
TYPE 405
REAR DOOR

Fig. 239. Door lock - swinging link

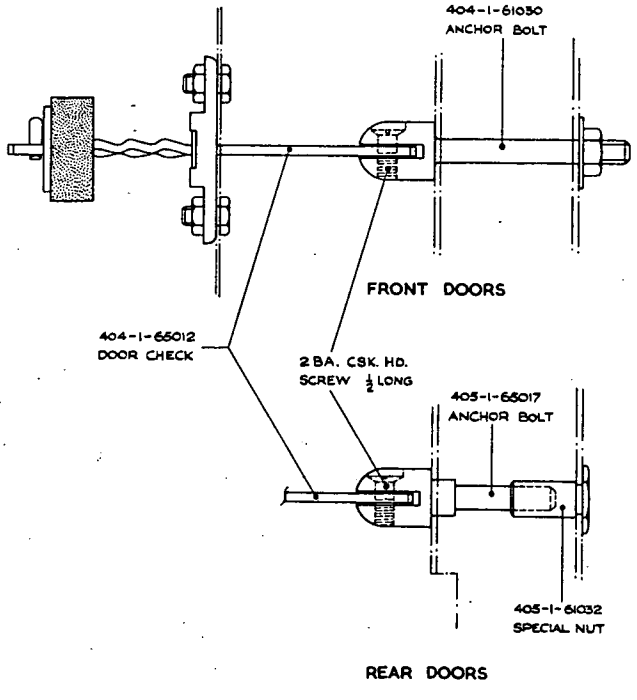


Fig. 240. Door check and anchorage

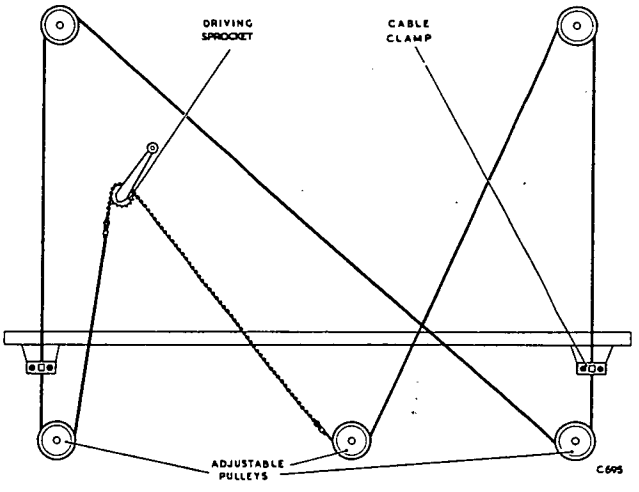


Fig. 241. Window winder cable

Referring to Fig.241. remove the window channel cable clamps and loosen the nuts of the three lower pulleys, this will allow the cable and chain to be lifted off.

Fit a new cable and chain over the pulley wheels, positioning the chain on the sprockets with the remaining links towards the centre pulley.

Adjust the three lower pulley wheels by pressing them downwards and tightening the nuts.

Refit the clamps to the window channel and tighten. Test the winder and if satisfactory well lubricate.

Refit the door upholstery.

Servicing

With the door upholstery panel removed periodically lubricate the pulley wheels and sprocket with oil and smear light grease over the cable and chain.

Check the cable for tension; too much slack in the cable will result in lost movement at the winding handle. To tighten a cable, lower the window to the stops and adjust each of the lower pulley wheels in turn.

Window Regulator

Type 405 Car.

This is the gear quadrant and arm type as shown in Fig.237.

Removing and Refitting Window Regulators

Remove the door panel upholstery.

Support the window and remove the screws securing the regulator to the door. Slide the arm out of the window glass channel and lower the glass to its stops.

To refit, reverse the removing procedure and lubricate the gear quadrant and window channel with light grease.

Fitting a Door Window Glass

Type 404 Cars.

Remove the door upholstery panel. Remove the Perspex draught deflector.

Remove the wood window sill and the furflex sealing.

Lower the window to its lowest position and remove the window channel cable clamps.

Carefully tip the glass forward and guide the rear edge up through the door frame and out through the window frame. Transfer the window channel from the removed glass to the new, using the rubber insertion between the glass and channel.

To refit the glass, carefully guide the forward edge down through the door frame and onto its runner, turn the glass and guide the rear end onto its runnder. Lower the glass to its lowest position.

Checking that the tension of the cable is correct and also the position of the chain on the sprocket refit and tighten the window channel cable clamps.

Check that the window works freely and smoothly and to its limit in both directions then refit the furflex sealing and window seal, refit the draught excluder and fit the door upholstery panel.

Type 405 Cars.

Front Doors

Remove the door upholstery panel and the wood sill and furflex sealing. Detach the bolts securing the lower parts of the window frame and remove the window regulators as described.

Carefully guide the window glass up through the door frame and out through the window frame.

Transfer the window channel from the removed glass to the new, using the rubber insertion between the glass and the channel.

To refit reverse the procedure and lightly grease the mechanism.

Rear Doors

Remove the door upholstery panel and the wood sill. Remove the arm rest plate and the window regulator. Take out the screws and bolts securing the window frame and lift out the window frame complete with the glass.

Transfer the window channel from the removed glass to the new, using the rubber insertion between the glass and the channel.

To refit reverse the procedure and lightly grease the mechanism.

Fitting a Quarter Light Glass

Type 404 Car.

Remove the two screws securing the toggle catch to the quarter light frame.

Open the quarter light fully, remove the screws attaching the hinge to the body and take away the quarter light. Remove the screws holding the two parts of the frame together and separate the frame.

Clean out the channel of the frame and fit the new glass using glazing rubber. Assemble the frame and refit the screws. Check that the sealing rubber is in good condition; fit new if necessary.

Refit the quarter light to the body and reconnect the toggle catch.

Removing and Refitting Front Door Ventilator

Type 405 Car.

Remove the chrome embellishers at each end of the metal finisher, fitted along the top of the upholstery and remove the metal finisher. Remove the wood sill.

Slacken the clamping bolts securing the lower pivot sufficiently to release the pivot. Remove the upper pivot screw and lift out the ventilator complete.

If a new glass is to be fitted remove the screws holding the frame together and separate the frame. Fit a new glass using glazing rubber.

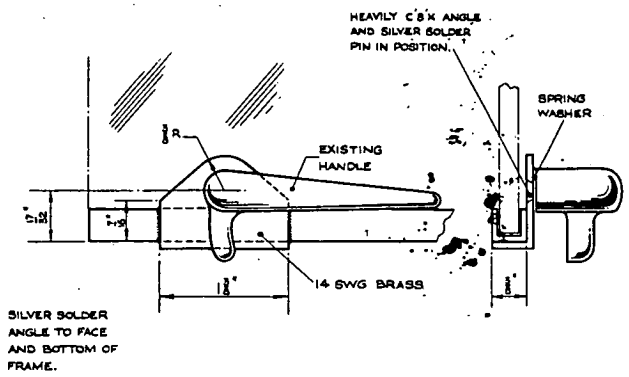
Check the sealing rubber and fit new if necessary. To refit the ventilator reverse the removal procedure, tightening the lower pivot clamp sufficiently to obtain an easy push operation.

Front Ventilator Closing Catch

In the event of the handle breaking away from the front ventilators it is not possible to obtain a complete replacement frame and glass.

In many instances the hinge positions have been altered and in all instances the ventilator to the door frame is not interchangeable.

If the bracket has broken away from the door frame it will be necessary to make a brass angle piece to the dimensions shown in Fig.242. Remove the glass from the frame attach the new angle and have the frame replated.



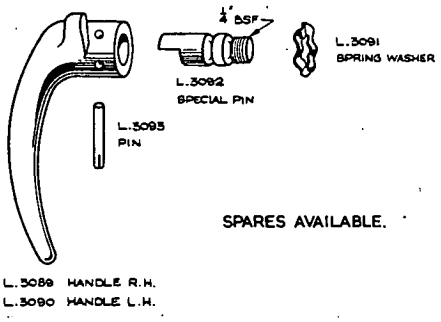


Fig. 242. Front ventilator closing catch

If the handle only has broken away then the glass should be removed and the existing bracket deeply countersunk in order to silver solder the pin back into position. If this is carefully carried out no replating is necessary.

Should the handle have dropped off and been lost spares are available as shown in Fig.242.

Wind Deflectors

To eliminate wind noise chromium plated angle pieces were attached to the window frame forward of the front ventilators as shown in Fig.243. These deflectors were not fitted to earlier cars and they can be obtained from the Spares Department.

Removing and Refitting Rear Quarter Light

Open the quarter light and remove the screw securing the quarter light to the toggle lever. Remove the screws securing the quarter light hinge to the window glass frame and lift away the quarter light complete.

If a new glass is to be fitted, remove the screws securing the hinge to the frame, separate the frame and remove the glass.

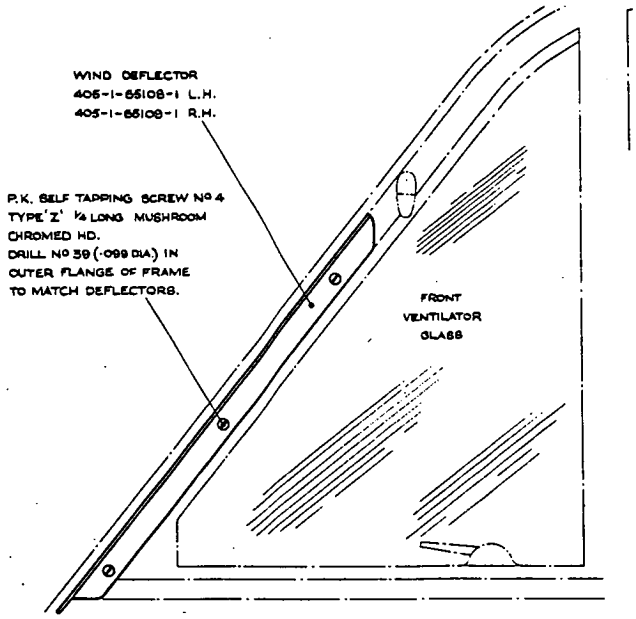


Fig. 243. Wind deflectors

Fit the new glass using glazing rubber and re-assemble the frame.

Check the sealing rubber for condition and replace if necessary.

To refit, reverse the removal procedure.

Removing and Refitting Rear Quarter Light Toggle Catch

Open the quarter light and remove the screw on the toggle lever securing the quarter light.

Remove the chrome embellishers and the metal finisher at the window sill.

Remove the two screws securing the toggle catch to the window sill.

To refit reverse the removal procedure.

Draught Deflectors

Type 404 Cars.

Perspex draught deflectors were fitted to later cars as shown in Fig.236 the perspex being held in position by two chrome plated strips and six self-tapping screws.

Removing and Refitting the Windscreen Glass

Special tools are required for fitting the 'Beclatite' rubber sections.

To remove and fit a windscreen glass first remove the wiper arms and blades complete.

Break the join in the rubber section and with the glass held, carefully pull out the rubber section all round and take away the glass. Remove the sealing from the windscreen aperture.

If the chromed glazing section is suspected for water leakage it should be removed by taking out the screws securing it to the windscreen aperture and carefully prised out bearing in mind that it was fitted with sealing compound.

Clean off all the old sealing compounds and apply a coat of 'Seelastic' to the frame and fit back into position, cleaning away the surplus sealing compound.

Offer the windscreen glass to the aperture and check the form of the glass in relation to its wood seating. This should be reasonable with no undue effort being necessary for the glass to seat. If there should be too much gap try another glass or shave away the wood. This is important as any undue strain will result in a broken glass even though the glazing operation may be carried out without immediately cracking the glass.

When the seating is satisfactory fit the inner glazing strip (Prestik sealer strip) to the aperture face.

Fit the windscreen glass and locate it by fitting short strips (about 2 inches) of sealing rubber at different points around the frame.

The sealing rubber for the Type 404 Windscreen is Beclatite R201 and for the Type 405 Windscreen Beclatite R206.

Using a special tool as shown in Fig.244 which must be appropriate to the rubber section being fitted, start on the top centre of the windscreen and gradually fit the section taking out the temporary pieces in turn. Use a rubber lubricant with the tool. Having glazed to the joint cut the rubber allowing 1/8 inch extra for compression. Insert the end against the joint and press the surplus which is formed into place with the thumb.

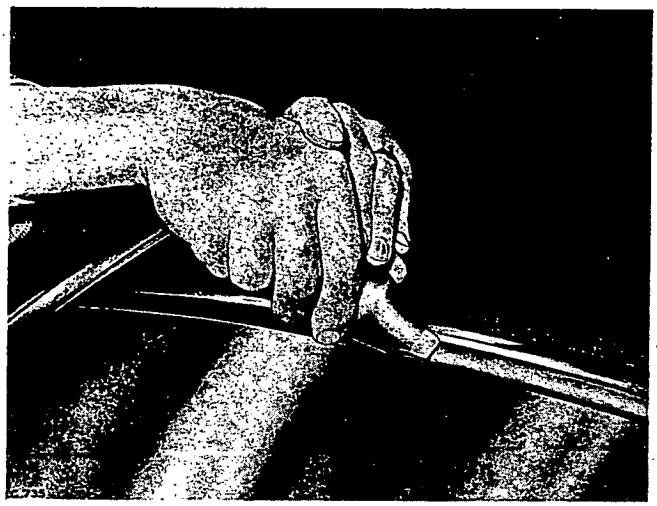


Fig. 244. Fitting windscreen rubber

Removing and Refitting the Rear Window

(See Fig. 245.)

Type 404 Car.

The rear window is removed and refitted in almost the same way as the windscreen, the difference being that the rear window is of Perspex instead of glass.

In the event of a new rear window being fitted a flat form cut to template will be supplied which should be carefully fitted to the aperture. As the window supplied is flat it will also be necessary to use more small pieces of rubber section at smaller intervals to retain it in position for final sealing.

The sealing rubber is Beclatite R201.

Removing and Refitting Back Light Glasses

(See Fig. 246.)

Type 405.

Remove the two chromium plate finishers which are lipped into the rubber section.

Break the join in the rubber section at the top and in the centre of the centre glass and with the glasses supported draw out the rubber section from all around the backlight. Separate and remove the glasses.

Remove the sealing from the backlight aperture. If the chromed glazing section is suspected of water leakage it should be removed by taking out the screws securing it to the aperture and carefully prised out bearing in mind that it was fitted with sealing compound. Clean off all the old sealing compound and apply a coat of 'Seelastic' to the frame and fit back into position cleaning away the surplus compound.

To refit the glasses fit the inner glazing strip (Prestik sealer strip) to the aperture face.

Locate the centre glass in the aperture by using short lengths (about 2 inches) of rubber section fitted at different points at the top and bottom of the glass.

Prepare the two lengths of rubber used between the glasses by:-

(A) Using the removed rubber.

(B) Using new rubber sections Claytonrite A5168 and A5018 and trim them identically to the removed rubber.

Fit these two sections, without the centre core rubber, and fit each backlight corner glass to the aperture locating them with the short sections of rubber.

The sealing rubber for the backlight is Beclatite R201.

Using a special tool as shown in Fig.244 which must be appropriate to the rubber section being fitted, start on the top centre of the centre glass and gradually fit the section unbroken around the three glasses. Use a rubber lubricant with the tool. Having glazed to the joint cut the rubber allowing 1/8 inch extra for compression. Insert the end against the joint and press the surplus which is formed into place with the thumb.

Fit the core rubber into the two sections between the glasses and see that the trimmed ends of the main central rubber are a good fit with the outer edge sealing rubber.

Finally refit the two chromium plated finishers. To help to do this, fit string under one lip of the rubber section, insert one edge of the chromium finisher under the other lip and keeping pressure on the finisher carefully pull away the string which should lift the lip of the rubber over the section.

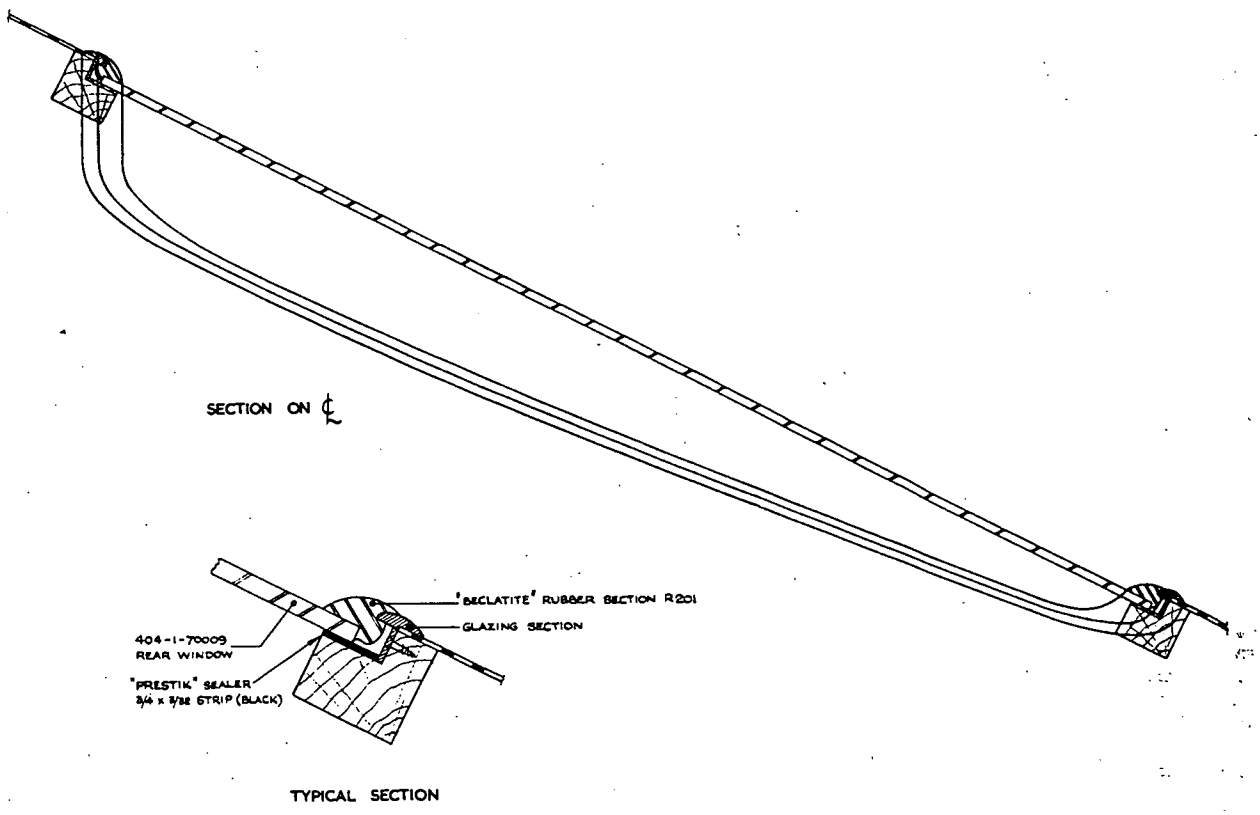


Fig. 245. Rear window assembly - Type 404

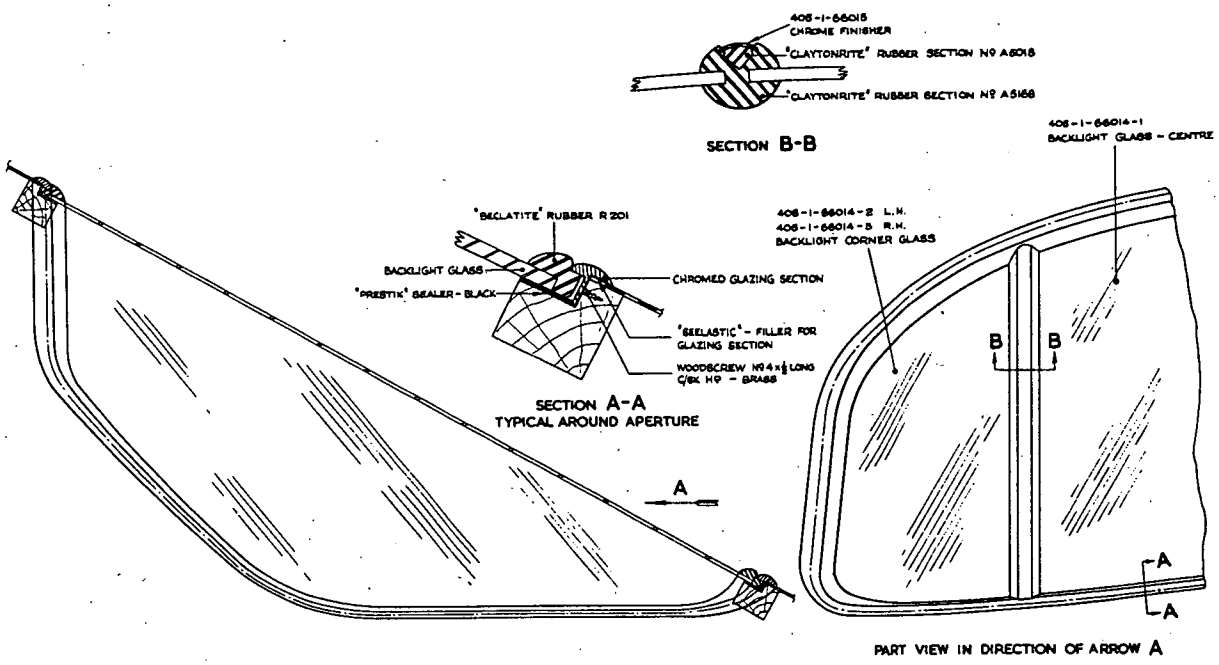
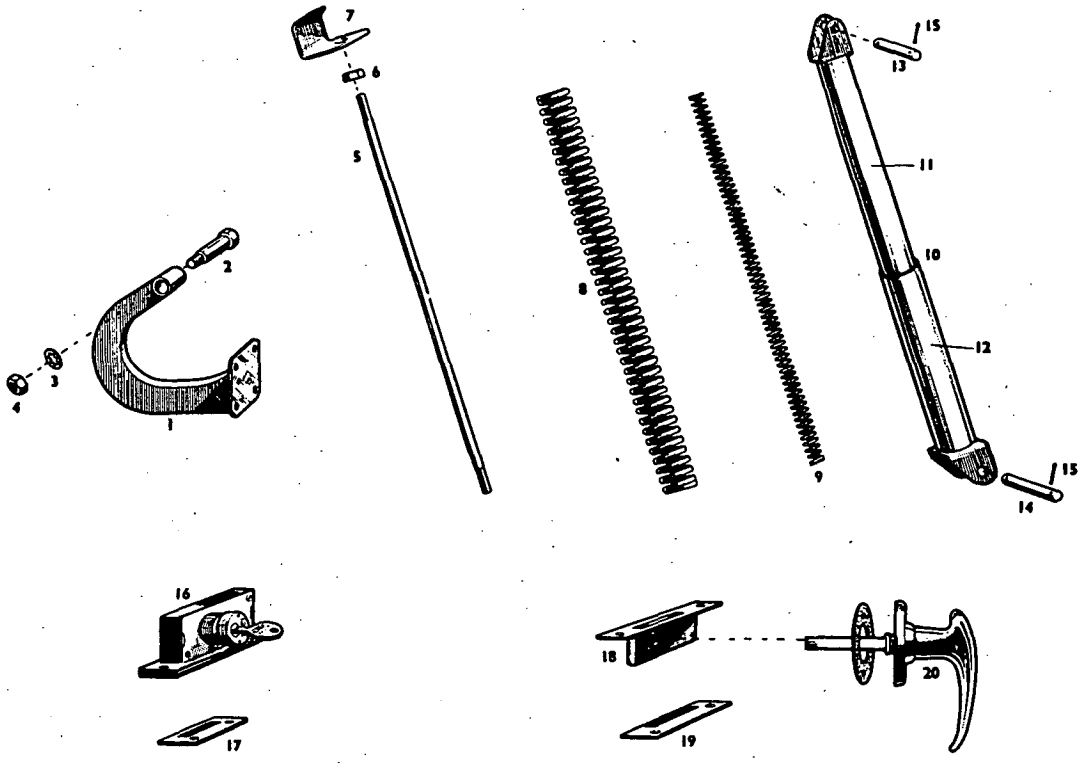


Fig. 246. Backlight glass assembly - Type 405

TYPE 405. BOOT DOOR FITTINGS.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.701336	1	Hinge Bracket	2	N.705679	10	Boot Door Spring Unit complete	1
N.701320	2	Pivot Bolt	2	N.705533	11	Inner Telescopic Tube	1
-	3	Washer ¼" Shakeproof	2	N.705532	12	Outer Telescopic Tube	1
FN.104/K	4	Nut ¼" BSF	2	N.705536-1	13	Pin - long	1
N.705680	5	Adjusting Rod	1	N.705536-2	14	Pin - short	1
-	6	Nut 2BA Plain	4	-	15	Split Pin 1/16" dia. ½" long	4
405-1-75006	7	Striker Plate Used up to Chassis 4136	1	405-1-75003	16	Mortice Lock with 2 Keys	1
				405-1-69025	17	Striker Plate	1
N.705531	8	Spring	1	405-1-75004	18	Budget Lock	2
SKN.3878	9	Spring - Inner Used up to Chassis 4136	1	405-1-69026	19	Latch Plate	2
				405-1-75005	20	Boot Door Handle	2



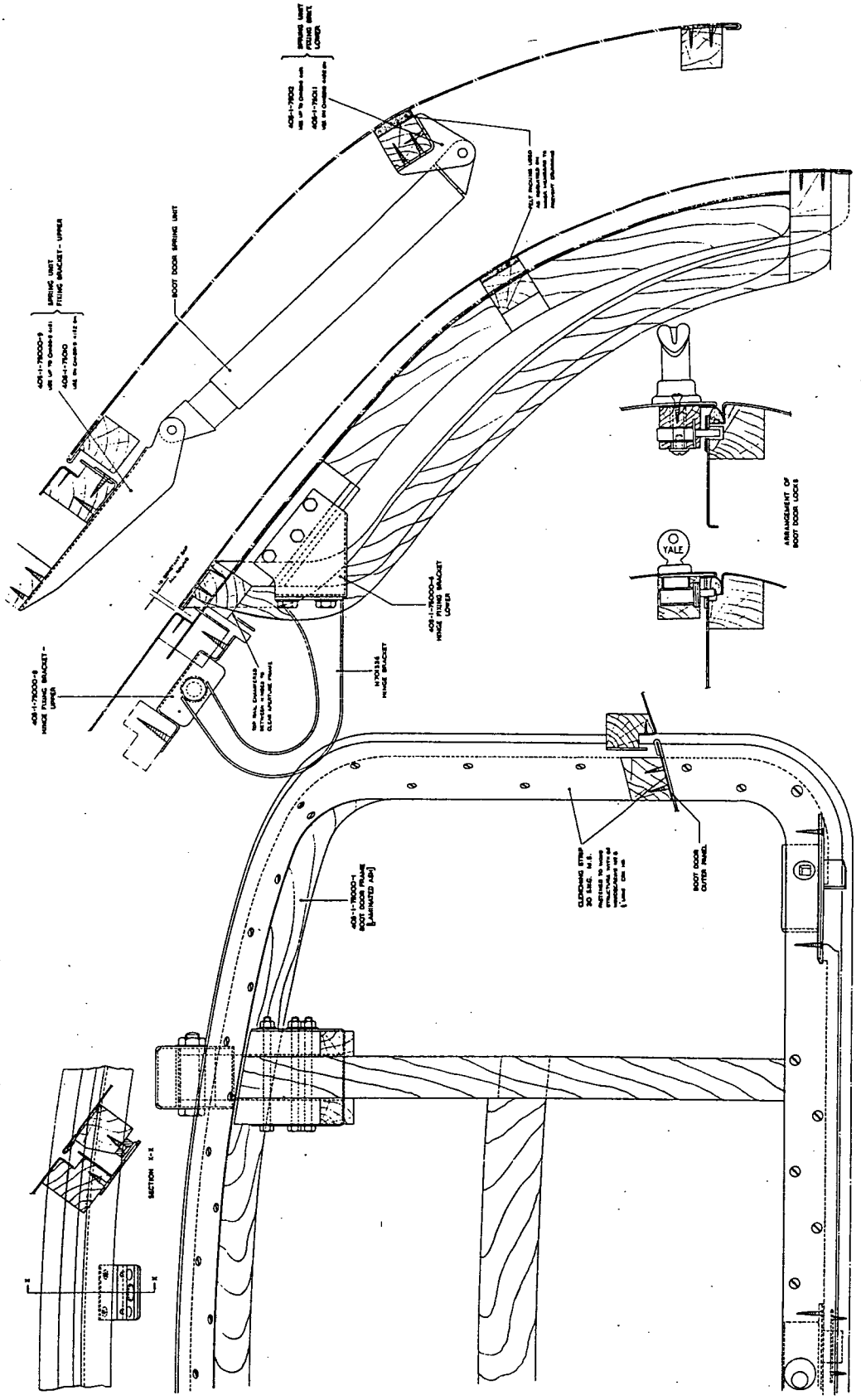


Fig. 247. Boot door assembly - Type 405

Type 405 Boot Door

The wooden door frame with its clenching strip see Fig.224 is externally covered by an aluminium panel.

Replacements

Due to variations in the boot door aperture during manufacture each door is individually fitted, consequently a complete replacement cannot be supplied. In the event of damage a wooden door frame complete with clenching strip would be supplied and a separate outer panel. The wood door frame should be swung on the hinges and should clear the inner aperture by approximately 3/16 inch all round. The edges of the clenching strip should be trimmed to give approximately 5/32 inch of clearance with the outer aperture.

When the outer panel has been clenched to the clenching strip there should be a gap of .10 inch all round. See Fig.247.

Hinges

The special hinges require little attention except to occasionally oil the hinge pins.

Locks

Three budget locks are fitted into the boot door frame Fig.247, two are operated by external handles while the central lock is locked with a Yale type key. Occasionally oil the locks.

To remove a handle operated lock take out the two Phillips screws from the escutcheon, open the door and from the back of the handle take out the screw and washer and withdraw the handle. On the lower edge of the door take out the two woodscrews and withdraw the lock.

To remove the centre lock, open the boot door, remove the small screw in the lock face, allowing the lock barrel to be unscrewed. Remove the two woodscrews securing the lock in the door frame and withdraw the lock.

Telescopic Stay Unit

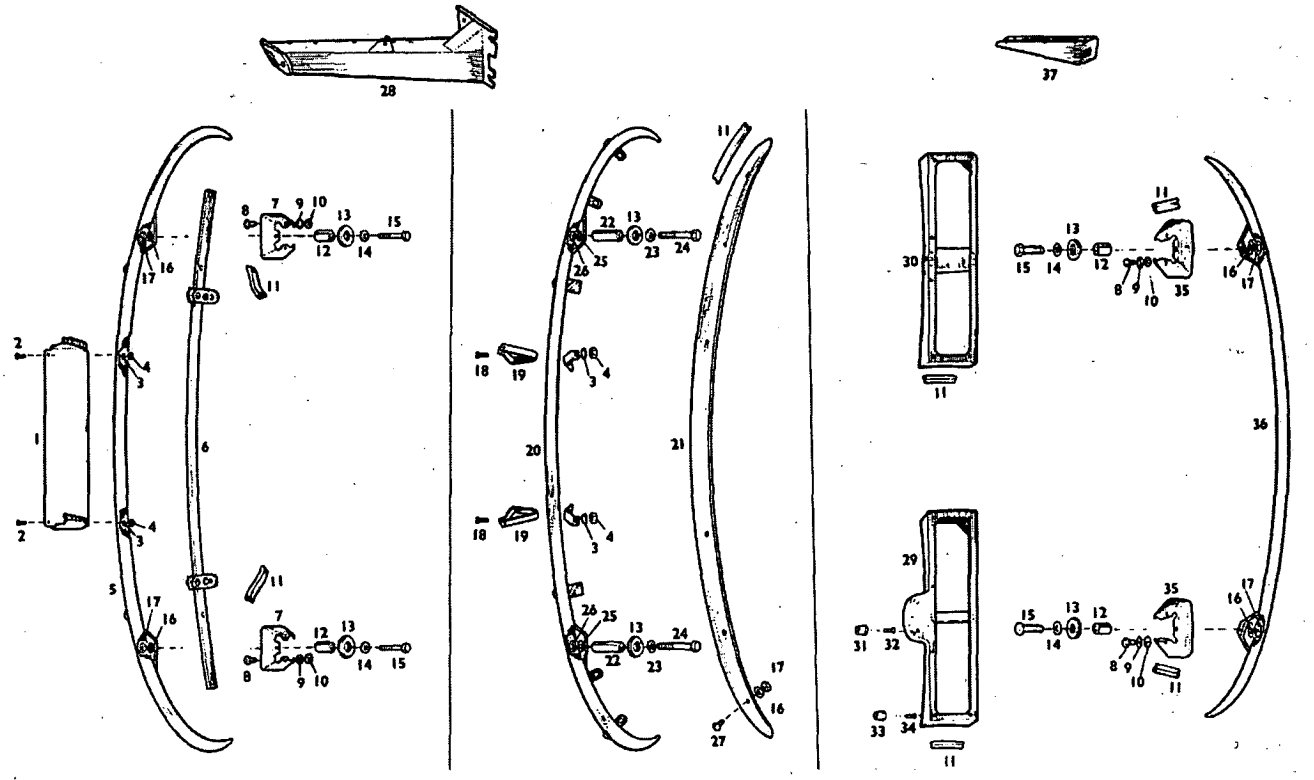
This spring unit should allow the door to balance evenly when opening and shutting. On earlier cars this was not satisfactory and an aluminium packing piece was inserted into the telescopic unit to give additional spring pressure. This was also unsatisfactory and at Chassis 4137 the brackets locating the telescopic unit were re-positioned which corrected the balance.

For cars previous to 4137 an inner spring SKN.3878 was introduced which will fit inside of the existing spring. This inner spring can be obtained from the Spares Department and care should be taken to see that the aluminium packing piece is removed from inside the unit when the inner and outer spring are removed.

The telescopic unit can be removed by taking out the split pins and withdrawing the top and bottom hinge pins. Release the centre bolt of the unit carefully as it is under spring pressure.

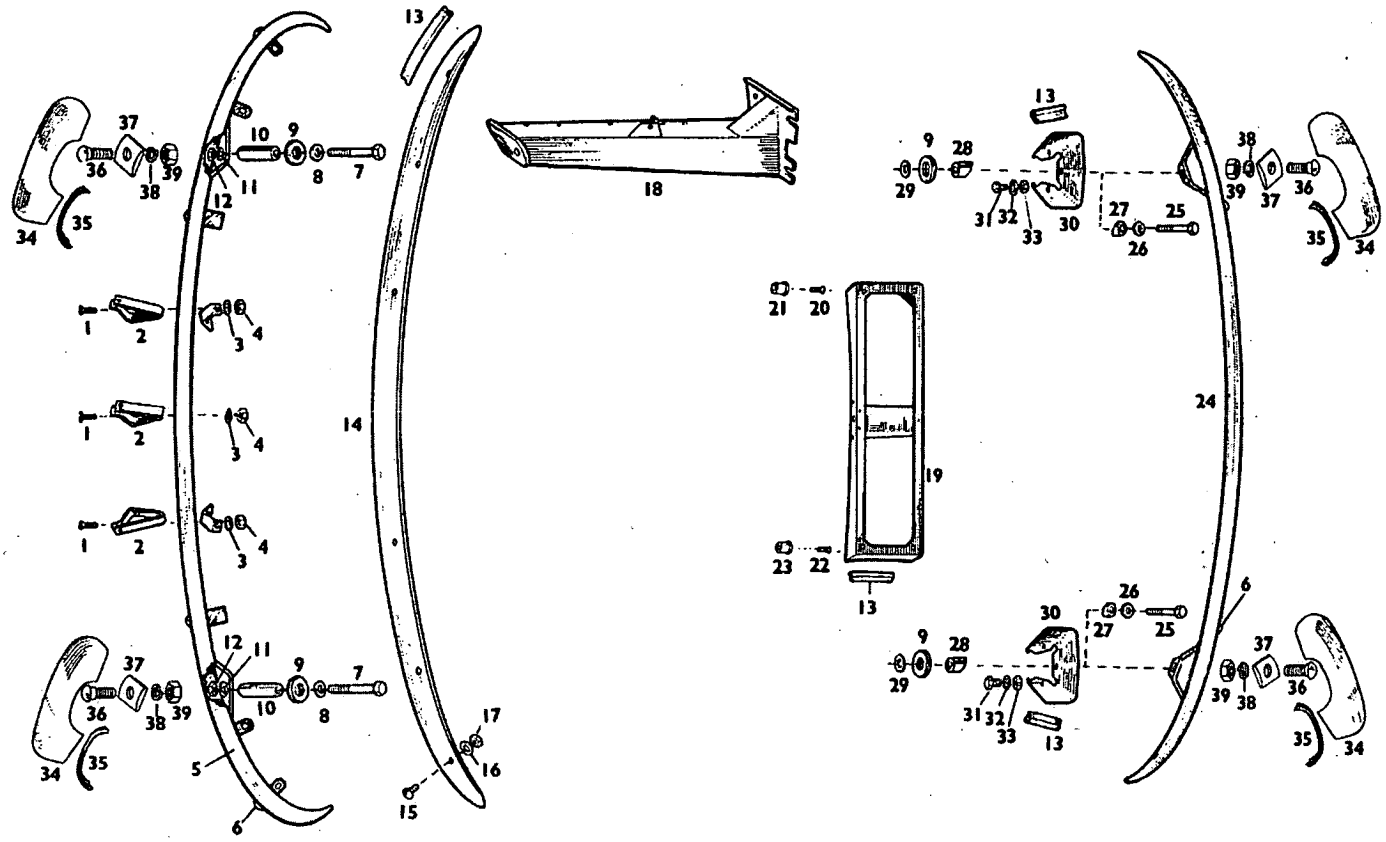
TYPE 404. FRONT AND REAR BUMPERS.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-66011	1	Mounting for Front Number Plate	1	404-II-66030	20	Front Bumper Bar Assy.) Used on	1
-	2	Screw ¼" Csk. Hd ½" long	2	404-II-66031	21	Apron)	1
-	3	Washer ¼" Shakeproof	2	404-II-66044	22	Distance Bush)	2
FN.104/L	4	Nut ¼" BSF	2	404-II-66045	23	Backing Washer) and	as reqd.
404-1-66007	5	Front Bumper Bar Assy.	1	FB.107/32D	24	Bolt 7/16" BSF Hex. Hd.) from	2
404-II-66043	6	Fog Lamp Mounting Bar	1			4" long)	
		Used on Chassis 2032 to 2051		-	25	Washer 7/16" Single Spring) Chassis	2
404-1-66009	7	Shroud for Front Bumper Mounting Bracket	2	FN.107/L	26	Nut 7/16" BSF)	2
-	8	Bolt 4BA Hex. Hd. ½" long	12	404-II-66039	27	Bolt - Rd. Hd. Chrome Plated) 2052	6
-	9	Washer 4BA Shakeproof	12	404-1-61095	28	Front Bumper Support Bracket LH	1
-	10	Nut 4BA	12	404-1-61096	-	Front Bumper Support Bracket RH	1
N.705598	11	Piping 1/8" Bead	as reqd.	404-1-66017	29	Rear Number Plate Fairing	1
404-1-66020	12	Distance Bush	2			Used up to Chassis 2051	
-	13	Grommet SIC.3716	4	404-II-66046	30	Rear Number Plate Fairing	1
-	14	Washer 3/8" Plain	4			Used on and from Chassis 2052	
FB.106/18D	15	Bolt 3/8" BSF Hex. Hd. 2¼" long	4	-	31	Rawlnut Type 5/C	4
-	16	Washer 3/8" Single Spring	4	-	32	Screw 2BA Csk. Hd 7/8" long	4
FN.106/L	17	Nut 3/8" BSF	4	-	33	Rawlnut Type 3/B	4
-	18	Screw ¼" BSF Csk Hd.) Used on	2	-	34	Screw 4BA Csk. Hd. 7/8" long	4
		3/4" long) and from		404-1-66010	35	Shroud for Rear Mounting Bracket	2
404-II-66038	19	Mounting for Front) Chassis	1	404-1-66008	36	Rear Bumper Bar Assy	1
		Number Plate) 2052		404-1-61084	37	Rear Bumper Mounting Bracket	2



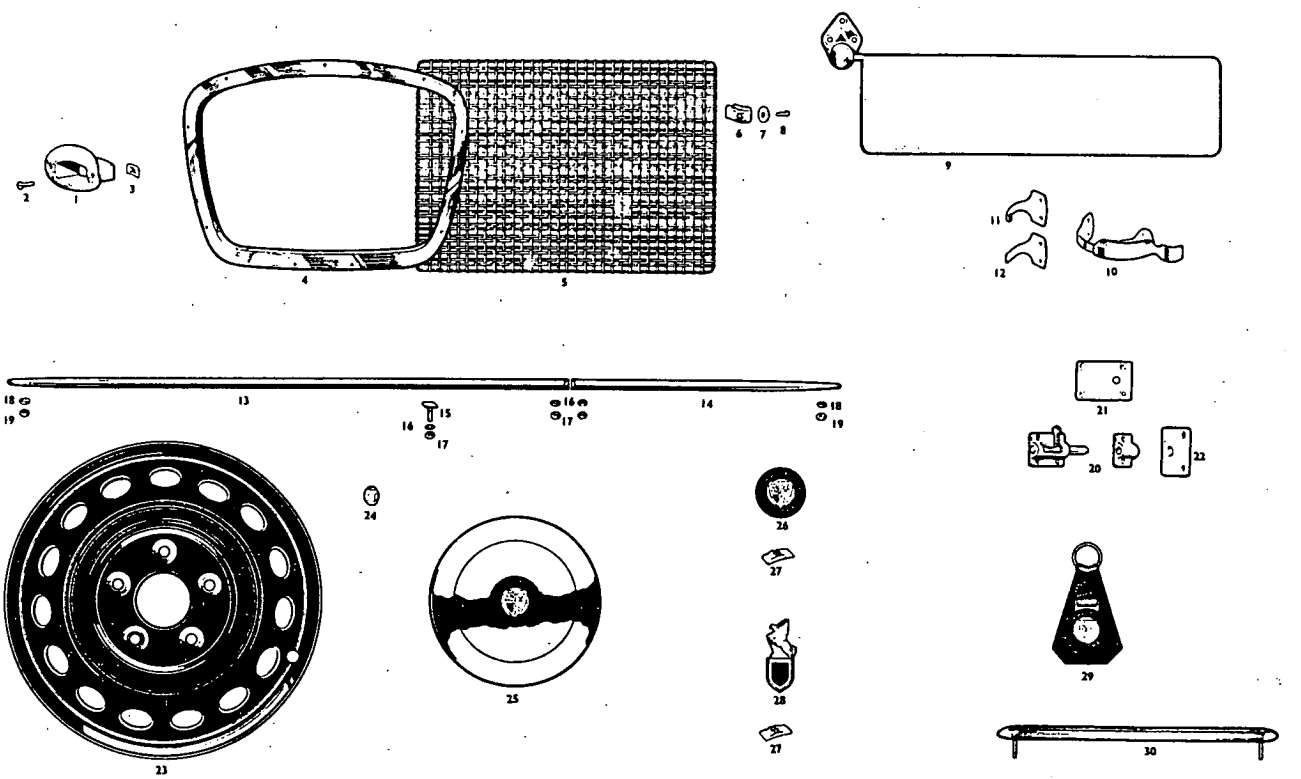
TYPE 405. FRONT AND REAR BUMPERS.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
-	1	Screw ¼" BSF Csk. Hd. ¾" long	3	-	20	Screw 2BA Csk. Hd. 1½" long	2
404-11-66038	2	Mounting for Front Number Plate	3	-	-	Screw 2BA Csk. Hd. 1" long	1
-	3	Washer ¼" dia. Shakeproof	3	-	21	Rawlnut - Type 5C	3
FN.104/L	4	Nut ¼" BSF Plain	3	-	22	Screw 4BA Csk. Hd. 7/8" long	4
404-11-66030	5	Front Bumper Assy.) Used up to	1	-	23	Rawlnut - Type 3B	4
404-11-66030-2	-	Front Bumper Bar only) Chassis 4047	-	404-1-66008	24	Rear Bumper Assy.) Used up to	1
				404-1-66008-2	-	Rear Bumper Bar only) Chassis 4047	1
405-1-66034	-	Front Bumper Assy.) Used on and after	1				
405-1-66034-1	-	Front Bumper Bar only) Chassis 4080	-	405-1-66035	-	Rear Bumper Assy.) Used on and after	1
				405-1-66035-1	-	Rear Bumper Bar only) Chassis 4048	1
404-1-66053	6	Bumper Bolt - Chromed - RS31-51	6	FN.106/18D	25	Bolt 3/8" BSF 2¼" long	2
FB.107/32D	7	Bolt 7/16" Hex Hd. 4" long	2	-	26	Washer 3/8" Single Spring	2
404-11-66045	8	Packing Washer	as reqd.	405-1-66029-2	27	Tapered Washer	2
-	9	Grommet SIC 3716	4	405-1-66029-1	28	Tapered Distance Bush	2
404-11-66044	10	Distance Piece	2	-	29	Washer 3/8" Plain	2
-	11	Washer 7/16" Single Spring	2	404-1-66010	30	Shroud for Rear Mounting Bracket	2
FN.107/L	12	Nut 7/16" BSF Plain	2	-	31	Bolt 4BA Hex. Hd. ½" long	6
N.705598	13	Piping 1/8" Bead	as reqd.	-	32	Washer 4BA Shakeproof	6
404-11-66031	14	Apron	1	-	33	Nut 4BA Plain	6
N.705722	15	Bolt - Chromed - RS31 - 9	6	405-1-66035-2	34	Over-rider	4
-	16	Washer 3/8" Single Spring	6	-	35	P.V.C. Moulding RS 65-2 (4½" each)	3ft.
FN.106/L	17	Nut 3/8" BSF	6	-	36	Bolt - RS31-62	4
404-1-61095	18	Front Bumper - Support Bracket LH	1	-	37	Packing Piece 0'2475'	4
404-1-61096	-	Front Bumper - Support Bracket RH	1	-	38	Washer 3/8" Single Spring	4
405-1-66002	19	Rear Number Plate Carrier	1	UFN/106A	39	Nut 3/8" dia. RS11-12	4



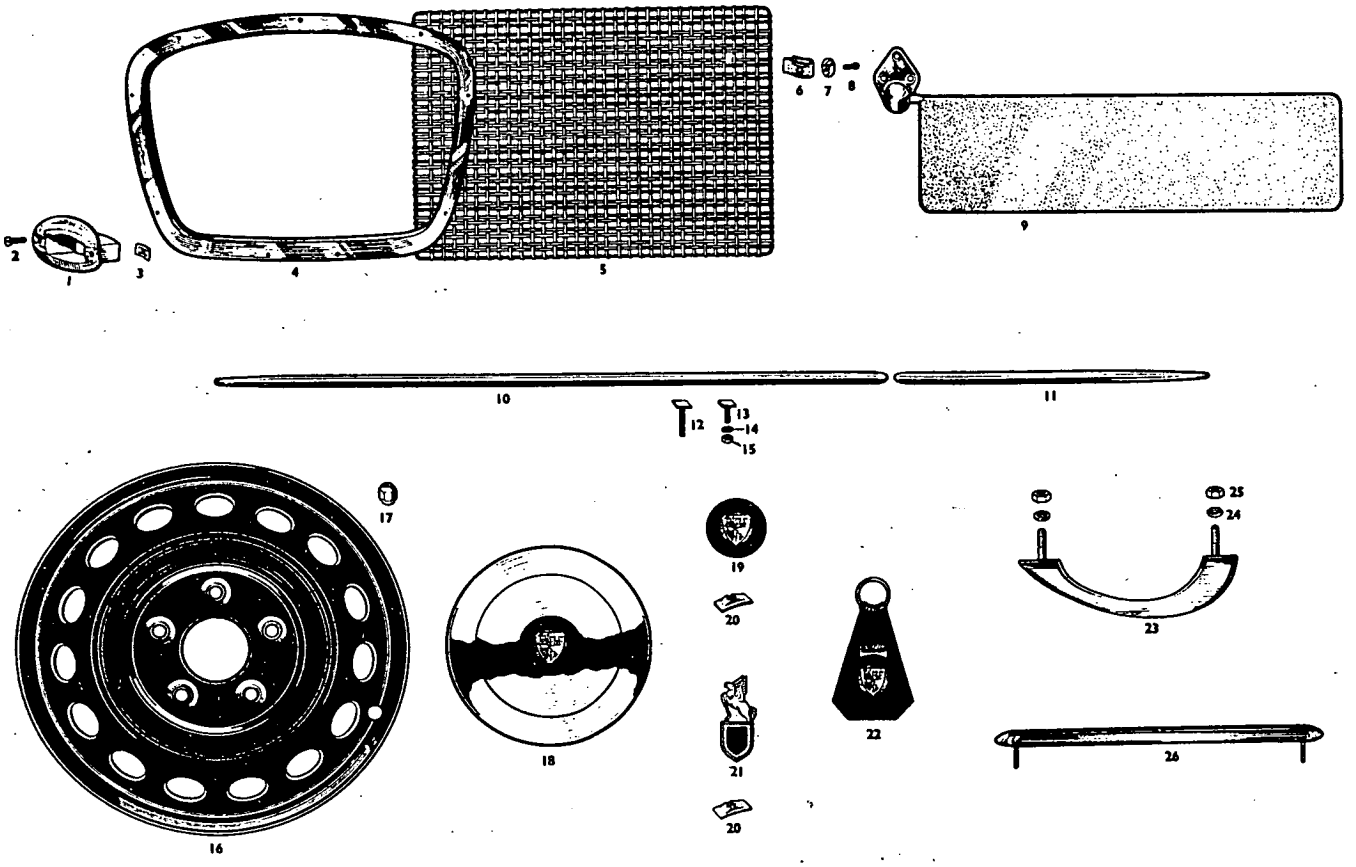
TYPE 404 STONEGUARD , WING FLASH ETC.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-66026	1	Escutcheon - Starting Handle Guide Tube	1	ND	16	Washer 2BA Shakeproof	10
ND	2	Screw 2 BA ½" long	2	ND	17	Nut 2BA Plain	10
ND	3	Spire Nut SNP.0164/17/8/0	2	ND	18	Washer 4BA Shakeproof	4
404-1-66023	4	Finisher for Radiator Aperture	1	ND	19	Nut 4BA Plain	4
404-1-66022	5	Stoneguard for Radiator Aperture	1	404-1-67030	20	Spring Bolt	2
ND	6	Spire Nut SNU 1219/17/9/0	14	404-1-67028	21	Striker Plate - Top	2
AGS157/B	7	Washer 4BA x 1" o/d x 1/16" thickness	14	404-1-67029	22	Striker Plate - Lower	2
ND	8	Screw No. 6 PK. Type J ½" long	14	404-1-20127	23	Road Wheel	5
404-1-67007	9	Sun Visor	2	N.580031	24	Wheel Nut	20
N.705818A	10	Quarter Light Toggle Fastener LH	1	N.704207	25	Snap on Cap with Medallion	4
N.705818B	-	Quarter Light Toggle Fastener RH	1	N.705800	26	Medallion	6
N.705574	11	Main Spring - Attachment Bracket	2	-	27	Fixing Plate SFP./0212/17/9/0	16
N.705817	12	Secondary Spring - Attachment Bracket	2	N.705799	28	'Bristol' Coachwork Insignia	2
404-1-66024-1	13	Wing Flash	2	N.707147	29	Key Ring	1
404-1-66024-2	14	Door Flash	2	404-1-67008	30	Demist Finisher	2
404-1-66025	15	Fixing Plate	6				



TYPE 405 STONEGUARD, WING FLASH ETC.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-66026	1	Escutcheon - Starting Handle Guide Tube	1	ND	14	Washer 2BA Shakeproof	26
ND	2	Screw 2BA ½" long	2	ND	15	Nut 2BA Plain	26
ND	3	Spire Nut SNPO164/17/9/0	2	404-1-20127	16	Road Wheel	5
404-1-66023	4	Finisher for Radiator Aperture	1	N.580031	17	Wheel Nut	20
404-1-66022	5	Stoneguard for Radiator Aperture	1	N.580371	18	Snap on Cap with Medallion	4
ND	6	Spire Nut SNU1219/17/9/0	14	N.580021	19	Medallion	6
AGS.157/B	7	Washer 4BA x 1" o/d x 1/16" thickness	14	-	20	Fixing Plate SFP/0212/17/9/0	16
ND	8	Screw No. 6 PK Type J ½" long	14	N.705456	21	'Bristol' Coachwork Insignia	2
404-1-67007	9	Sun Visor	2	N.707117	22	Key Ring	1
404-1-66050-1	10	Wing Flash	2	404-1-63037	23	Grab Handle	1
404-1-66050-2	11	Door Flash	2	-	24	Washer ¼" Shakeproof	2
404-1-66051	12	Fixing Plate - long	2	FN.104/L	25	Nut ¼" BSF	2
404-1-66052	13	Fixing Plate - short	24	404-1-67008	26	Demist Finisher - Up to Chassis 4136	2
				405-1-67031	-	Demist Finisher - Chassis 4137 on	2



Bumpers

Attachment of the bumpers is by straightforward bolting to the chassis attachment brackets.

Marchal type fog lamps are fitted beneath the front bumper on the Type 405 Cars and are bolted to the bumper bar.

On later Type 405 Cars over-riders are fitted.

A narrow aluminium apron is fitted between the front bumper and the body on Type 405 Cars. Should a replacement be required it is supplied not drilled and not painted.

Removing and Refitting Stoneguard from Air Intake Aperture

Remove the bonnet, then remove the securing screws and plain washers from the grille and chromium frame.

To refit, position the spire type nuts correctly over the holes, fit the chromium frame, position the grille and secure with the Parker Kalon screws and plain washers.

Removing and Renewing the Escutcheon. Starting Handle Guide

Early escutcheons have two studs brazed to the inner face and attached by shakeproof washers and nuts, while later escutcheons have two countersunk holes and are attached by Phillips 2BA Chromed Screws and Spire Nuts. The later type only is supplied as a spare.

To obtain access to the nuts it will be necessary to remove the bonnet.

During manufacture each escutcheon is fitted to the car to suit the contour and finally plated. This is considered impracticable for spares and they are supplied fully finished. It may be necessary however to alter the shape carefully to suit the car without damaging the plating.

Wing Flash and Door Flash

Type 404 Cars and early Type 405 Cars are fitted with tapering flashes. Later Type 405 Cars are fitted with parallel flashes. This was for economy reasons.

In the event of damage to the earlier cars it is recommended that a complete set of the smaller parallel type are fitted.

To remove the door flash the upholstery panels have to be removed. To remove the wing flash, lift the wing valance.

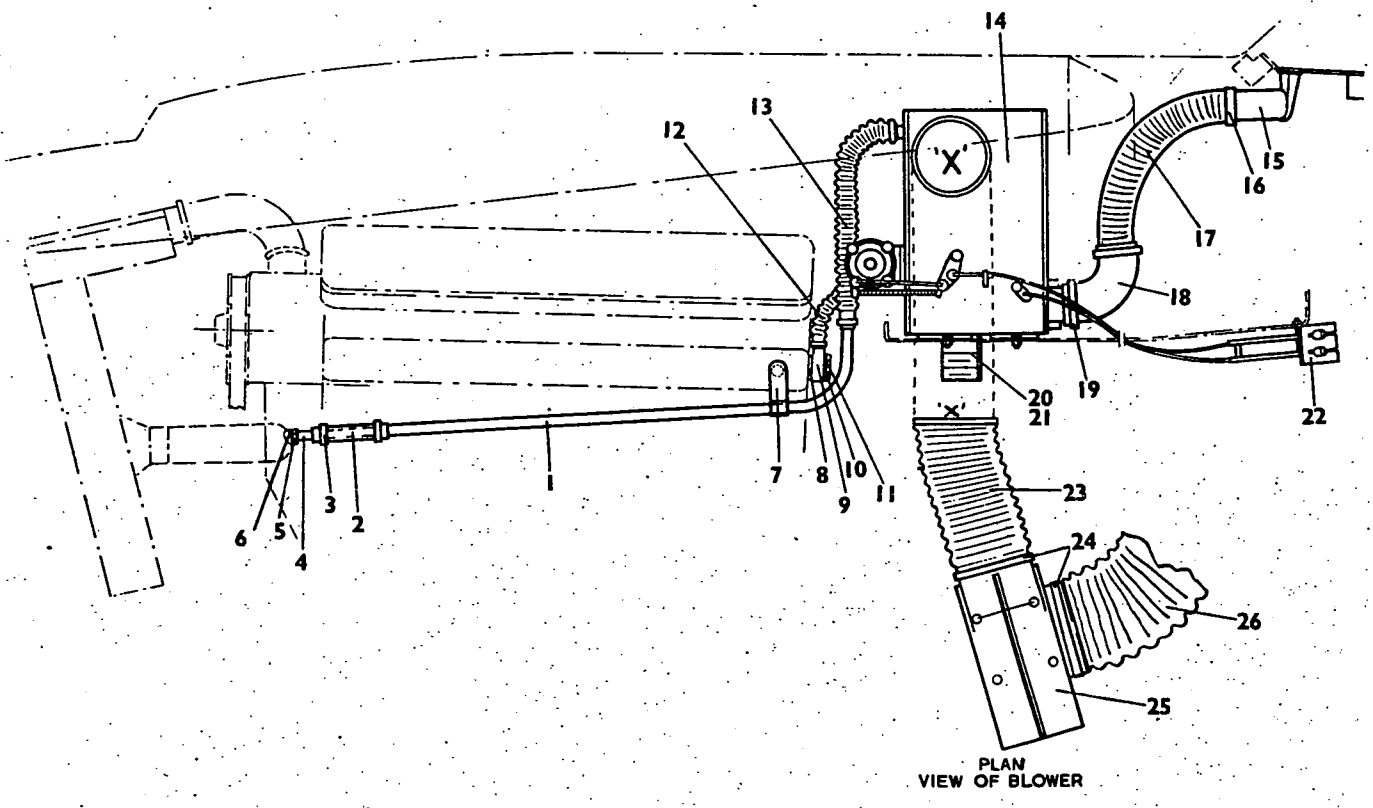
Heater and Demist

List of Contents

Heater and Demist

HEATING & VENTILATING SYSTEM (CHASSIS 2001 TO 2019).

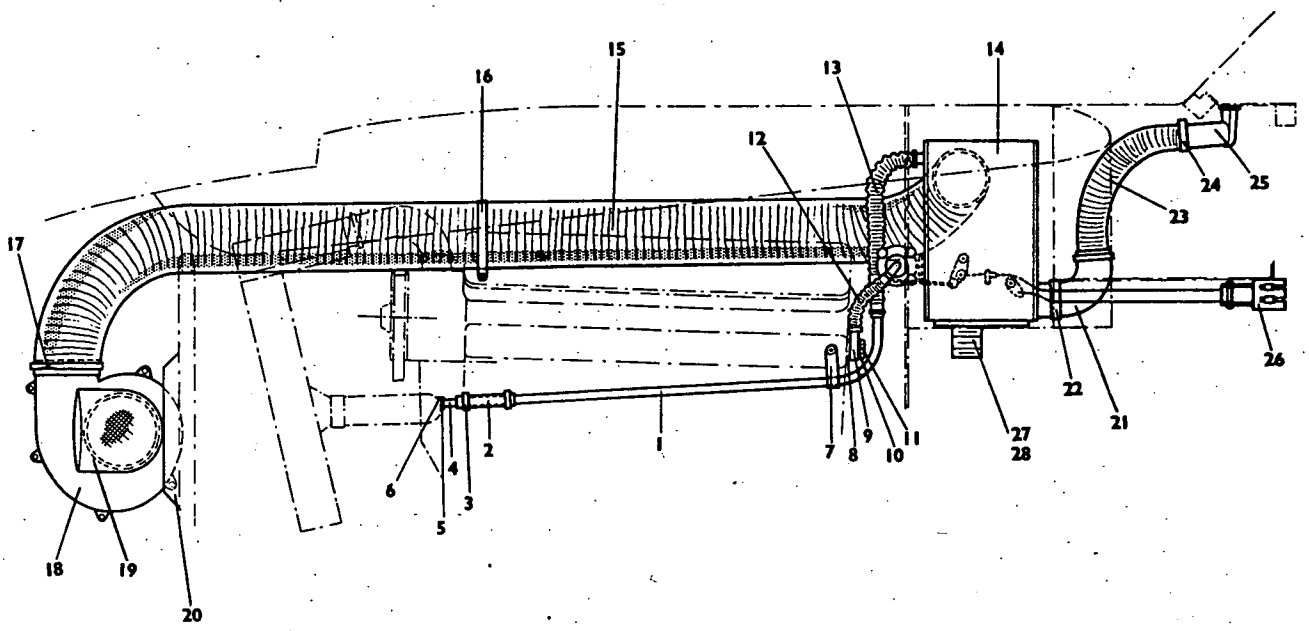
Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-73000-2	1	Pipe - Radiator Hose to Heater	1	-	17	Compoflex Hose 1¼" i/d x 19" long	2
-	2	Rubber Hose ½" i/d x 7/8" o/d x 2½" long	1	Smiths			
N.707102-14	3	Hose Clip	6	CHS.299/1	18	Demist Elbows	2
404-1-73009	4	Connector	1	404-1-73012	19	Hose Clip - Jubilee No. 1X	2
N.631911	5	Nut	1	Smiths			
N.631901	6	Special Washer	1	CHS.2280	20	Outlet Deflector	1
404-1-73000-1	7	Pipe Clip	1	Smiths			
N.321190	8	Fibre Washer	1	CHS.2100	21	Base Seal	1
404-1-73003-3	9	Banjo Connection and Pipe	1	Smiths			
N.321300	10	Fibre Washer	1	CHS.1065/68	22	Control Unit with Switch	1
N.321180	11	Cylinder Head Banjo Bolt	1			Smiths CHS 2067/60 Control Cable (1)	
-	12	Rubber Hose - Convuluted ½" i/d 11" long	1			Smiths CHS 2067/72 Control Cable (1)	
-	13	Rubber Hose - Convuluted ½" i/d 8" long	1	-	23	Compoflex Hose 3½" i/d x 8" long	1
				N.707067	24	Hose Clip - Jubilee No.5.	2
Smiths				Smiths			
CHS.2000/5	14	Heater	1	CHS.4015/11	25	Blower	1
404-1-61081	15	Demist Duct LH	1	-	26	Compoflex Hose 4" i/d x 14" long	1
404-1-61082	-	Demist Duct RH	1			(To Scuttle Ventilator)	
404-1-73013	16	Hose Clip - Jubilee No.1A	2				



PLAN
VIEW OF BLOWER

HEATING AND VENTILATION SYSTEM. (CHASSIS 2020 ONWARDS)

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
404-1-73000-2	1	Pipe - Radiator to Heater	1	404-II-73014	19	Blower Inlet Cowl	1
-	2	Rubber Hose ½" i/d x 7/8" o/d x 2½" long	1	404-II-73000-	20	Blower Mounting Angle	1
N.707102-14	3	Hose Clip	6	Smiths			
404-1-73009	4	Connector) Not used with	1	CHS2099/1	21	Demist Elbow	2
N.631911	5	Nut) new type	1	404-1-73012	22	Hose Clip - Jubilee No. 1X	2
N.631901	6	Special Washer) Radiator Hose	1	-	23	Compoflex Hose 1¼" i/d 19" long	2
404-1-73000-1	7	Pipe Clip	1	404-1-73013	24	Hose Clip - Jubilee No.1A	2
N.321190	8	Fibre Washer	1	404-II-63072-			
404-1-73000-3	9	Banjo Connection & Pipe	1	31	25	Demist Duct LH	1
N.321300	10	Fibre Washer	1	404-II-63072-			
N.321180	11	Banjo Bolt	1	32	-	Demist Duct RH	1
-	12	Rubber Hose - Convuluted ½" i/d x 11" long	1	Smiths	26	Control Unit with Switch & Control Cables	1
-	13	Rubber Hose - Convuluted ½" i/d x 8" long	1	CHF/1065/105			
Smiths				Smiths			
CHS2000/12	14	Heater	1	CHS2280	27	Outlet Deflector	1
-	15	Compoflex Hose 3¼" i/d x 84" long	1				
404-II-73000-2	16	Saddle Clip	1	Smiths			
N.707067	17	Hose Clip - Jubilee No.5	3	CHS2100	28	Base Seal	1
Smiths							
CHS4015/11	18	Blower	1				



Heater and Demist

General Description

The Heating, Ventilating and Demist System comprises basically of three components, Blower Unit, Heater Box and Quadrant Control. On the Type 404 Chassis No.2001 to 2019 a controllable scuttle ventilator is fitted for use in conjunction with the system. The scuttle ventilator is operated by the push/pull knob marked 'V' on the left hand side of the instrument panel.

Blower Unit

The blower unit on the Type 404 Chassis No.2001 to 2019 is fitted in the left hand side of the scuttle tray see Fig.248. On Type 404 Chassis No.2020 onwards and all Type 405 cars the unit is mounted in front of the radiator on the right hand side see Fig.249. The blower unit is operated by pulling out the lower lever on the quadrant control.

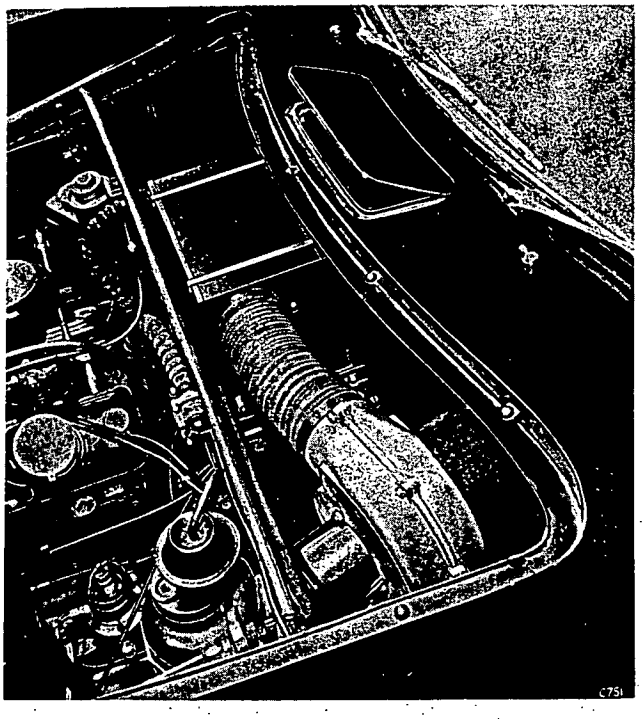


Fig. 248. Heater box and blower unit (Type 404 car chassis No. 2001-2019)

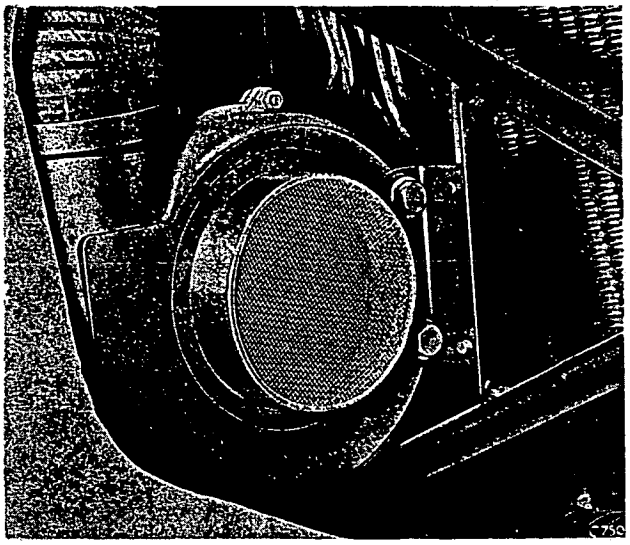


Fig. 249. Blower unit (Type 404 chassis No. 2020 onwards and Type 405 cars)

Removing and Refitting. Type 404 Chassis No. 2001 to 2019

To remove the blower unit disconnect the battery and the electrical feed wire to the blower unit. Release the hose clips from either end of the blower. Working from inside the parcel shelf, release the two mounting bracket securing nuts and remove the four bolts. Slide the unit forward and lift out.

For refitting the procedure is reversed.

Removing and Refitting. Type 404 Chassis No. 2020 Onwards and All Type 405

To remove the blower unit disconnect the battery and the electrical feed wire to the blower. Remove the bonnet and spot lamp. Release the twelve screws and washers to remove the air intake aperture grille. Release the hose clip securing the air pipe to the blower unit. Support the blower and remove the four bolts attaching the mounting bracket to the mounting channel. Remove the blower unit through the air intake aperture.

For refitting the procedure is reversed.

Heater Box

The heater box is installed in the scuttle tray see Fig.248 on Type 404 Cars Chassis 2001 to 2019. On

Type 404 Cars Chassis 2020 onwards and all Type 405 Cars see Fig.250. The heater box incorporates the heater radiator and control flaps. The flaps are operated by the quadrant control. The heater radiator is supplied with hot water from the engine cooling system via a water control valve. The hot air from the box provides the heating system to the interior of the car and the demisting and defrosting system to the windscreen.

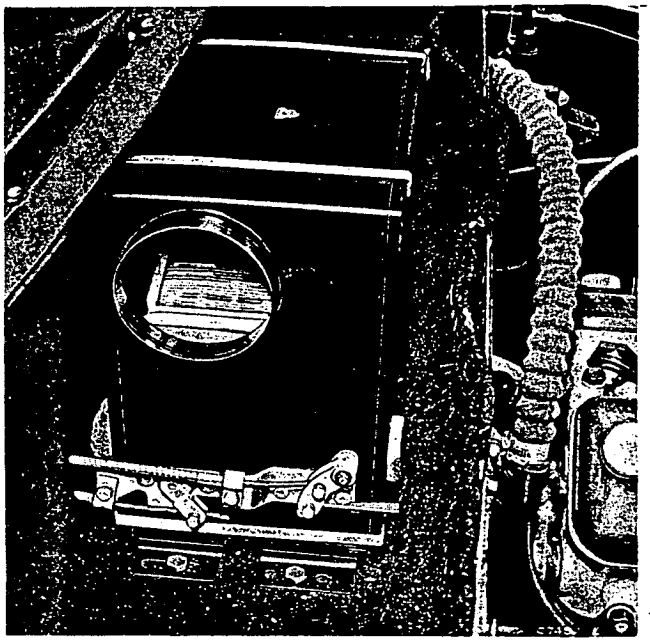


Fig. 250. Heater box (Type 404 chassis No. 2020 onwards and Type 405 cars)

Removing and Refitting

To remove the heater box drain the engine cooling system. Release the hose clips attaching the heater box to the air pipe and the water return pipe to the engine radiator. Release the hose clip attaching the water valve to the water supply pipe. Remove the water valve from the heater box by removing the two screws and releasing the control rod and return spring. Release the attachments of the inner and outer control cables from the heater box. Working from inside the car disconnect the flexible drive cable from the speedometer. Remove the side, bottom and rear trimming panels. Release the hose clips attaching the demist pipe to the demist elbow. Remove the four nuts and bolts securing the heater box to the scuttle tray. Lift out the heater box.

For refitting the procedure is reversed using a suitable adhesive to refix the parcel shelf trimming panels. Re-adjust the controls.

Adjustment of Controls.
Heating/Ventilating Control See Fig.250.

1. Move the ventilating lever on the quadrant control to the "off" position. The air valve lever on the heater box should now be at its extreme anticlockwise position and negligible air should enter the car with the blower running (ie only reasonable valve leakage).

2. Move the ventilating control lever to the "hot" position. The air valve lever on the heater box should now be at its extreme clockwise position with the water valve lever about to commence closing.

3. If the correct operation at (1) or (2) is not obtained the length of the inner cable should be adjusted as follows. Slacken the clamping screw of the inner cable at the heater box. Slide the cable through the trunnion. Retighten the screw and recheck as in (1) and (2).

4. Move the ventilating control to the "cold" position. The lever on the water valve should now be in the vertical position, with the water flow to the heater cut off. With the engine and blower running, cold air should enter the car within 2-3 minutes. If this is not so it indicates that water is still flowing through the heater radiator core. This can be checked by removing the return water hose from the heater box and observing whether water is issuing from the heater core when the engine is running at normal speeds. Close the open end of the pipe manually to prevent loss of water.

   If the water is issuing from the heater core slacken the clamp screw holding the water valve operating rod and move the water valve independently of the heater valve. A slight resistance to motion should be felt as the lever approaches and passes the vertical position indicating that the valve is seating correctly. If this resistance is not felt turn the centre adjusting screw on the water valve lever approximately 1/4 turn in a clockwise direction. With the ventilating control in the "cold" position and the water valve lever in the vertical position retighten the control rod clamping screw.

Demisting/Defrosting Control

1. Move the demisting lever on the quadrant control to the "off" position. The demist lever on the heater box should be at its extreme clockwise position. No air should pass through to the windscreen with the blower running.

2. Move the demist control lever to the "defrost" position the demist lever on the heater box should now be at its extreme anticlockwise position.

3. If the correct operation at (1) and (2) is not obtained, the adjustment to the demisting/defrost control cable cable should be made in a similar manner as stated for the adjusting of the heating/ventilating control.

Removing and Refitting Demister Pipes

To remove the demister pipes see Fig.251. Disconnect the flexible drive cable from the speedometer and remove the side, bottom and rear parcel shelf trimming panels. Release the hose clips from the heater box elbows and demist ducts. Remove the demister pipes.

For refitting the procedure is reversed, using a suitable adhesive to refix the parcel shelf trimming panels.

Quadrant Control

The quadrant control is fitted centrally beneath the parcel shelf see Fig.252. If additional air flow is desired, open the rear quarter light to suit requirements. The control positions for various conditions are as follows.

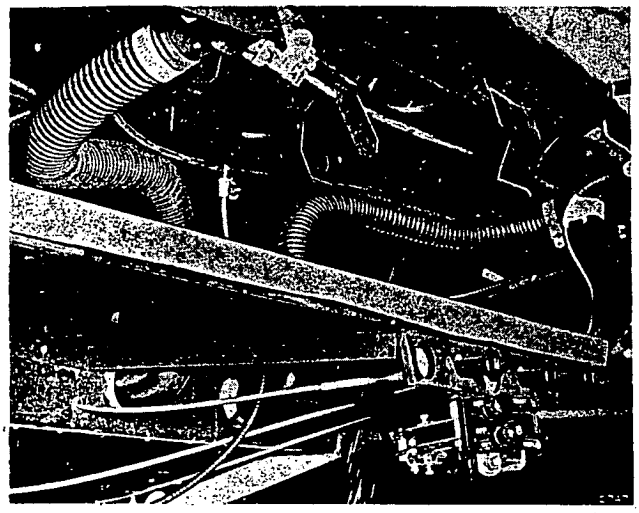


Fig. 251. Assembly of demister pipes

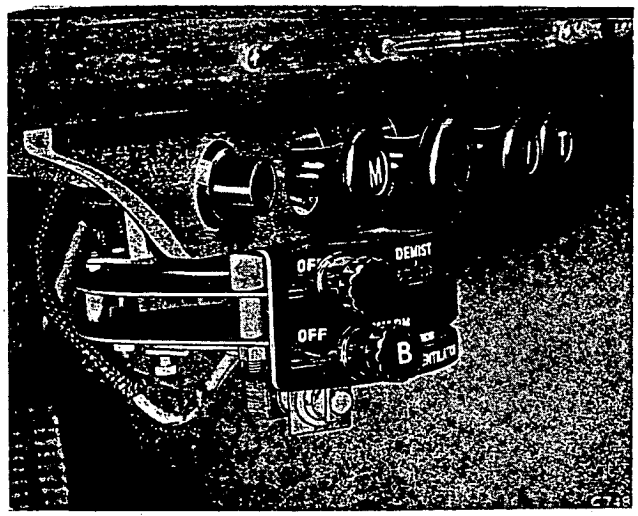


Fig. 252. Heating/ventilating quadrant control

Type 404 Car Chassis No. 2001-2019

1. For Recirculation.

   Scuttle flap closed and the blower unit switched "on" set the ventilating control to the temperature required.

2. Warm Weather.

   Open the scuttle flap and set the ventilating control to "cold". In addition the blower unit may be switched "on" and the screen control set to "demist" or "defrost" to suit requirements.

3. Cold Weather.

   With the scuttle flap partially opened and the blower switched "on" set the ventilating control to a position between "warm" and "hot" and the screen control to "demist"

4. Freezing Conditions.

   Scuttle flap closed, set the screen control to "defrost" and the ventilating control between "warm" and "hot" as desired. For extreme icing conditions move the ventilating control to "off".

Type 404 Car Chassis 2020 Onwards and Type 405 Cars

1. No heating and no ventilating.

   Set the ventilating and screen controls to the "off" positions.

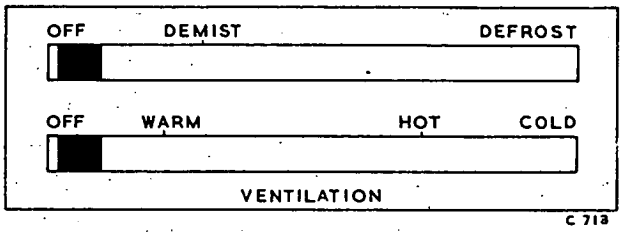


Fig. 253. Heater control positions

2. Warm Weather.

   When an equal supply of cool air is desired switch the ventilating control to "cold" and the screen control to "demist"

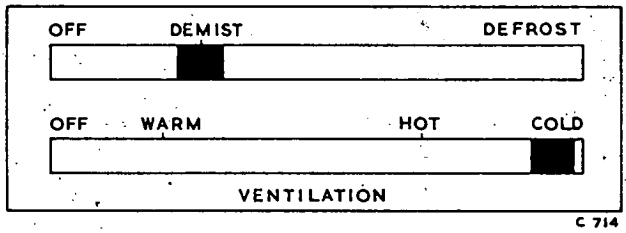


Fig. 254. Heater control positions

3. Warm Weather.

   When maximum air circulating at head level is desired switch the ventilating control to "cold" and the screen control to "defrost".

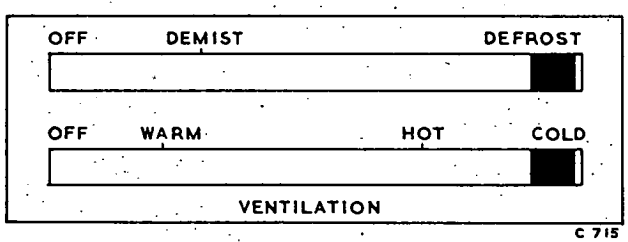


Fig. 255. Heater control positions

4. Cold Weather.

   Set the ventilating control to a position between "warm" and "hot" and the screen control to "demist".

5. Freezing Conditions.

   Set the ventilating control to a position between

"warm" and "hot" as desired and the screen control to "defrost". For extreme icing conditions move the ventilating control to "off".

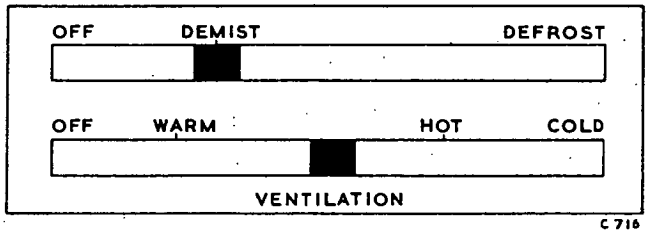


Fig. 256. Heater control positions

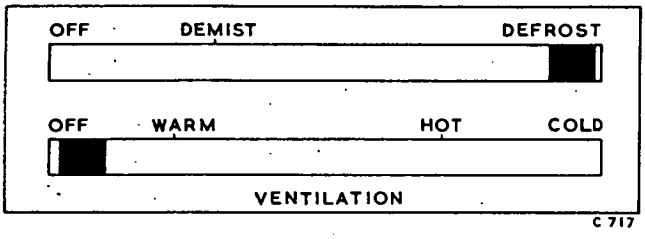


Fig. 257. Heater control positions

Removing and Refitting.

To remove the quadrant control first disconnect the battery. Working from the underside of the parcel shelf support the quadrant and remove the two securing nuts from the mounting bracket. Release the two clamps securing the two outer casings, release and remove the trunnion nipples attaching the two inner control cables. Release the centre clamp attaching the electrical supply cable. Unsolder the two electrical connections from the blower motor control switch and remove the quadrant control.

To fit a replacement unit. Solder the electrical connections to the switch, attach the centre clamp securing the electrical cable, refit the inner cables and outer casings, re-assemble the quadrant control to the mounting bracket. Connect the battery.

Check the controls and re-assemble if necessary.

Removing and Refitting Scuttle Ventilation Flap

To remove the scuttle ventilating flap see Fig.258. Open the flap fully remove the split pin and spring washer attaching the flap stay to the swivel bolt. Remove the four nuts and screws securing the flap hinges to the scuttle. Remove the ventilating flap.

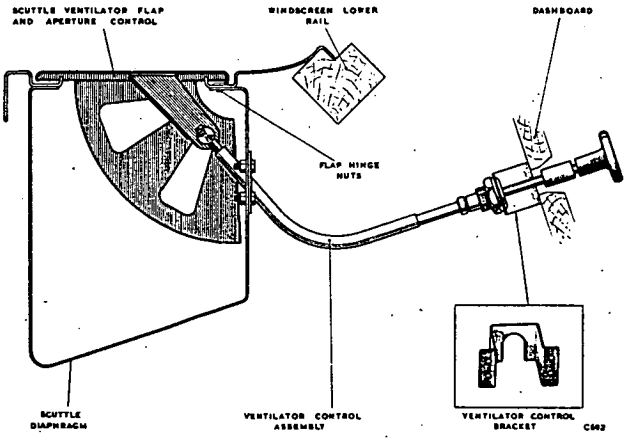


Fig. 258. Scuttle ventilator assembly

For refitting the procedure is reversed.

Removing and Refitting Scuttle Ventilation Control

To remove the scuttle ventilating flap control see Fig.258. Remove the flap as previously described, followed by the swivel bolt from the end of the control. Working from inside the car remove the spring loaded control knob marked "V" and the four nuts and bolts attaching the control mounting bracket to the scuttle diaphragm. Release the nut securing the control to the mounting bracket on the dashboard. Slide the control clear of the mounting bracket and withdraw from the underside of the dashboard.

For refitting the procedure is reversed.

Tracking

List of Contents

Tracking

Tracking

Wheel Alignment and Tracking

Wheel Base - Type 404.....96.25 inches.
Wheel Base - Type 405.....114 inches.
Track-Front.....52.36 inches.
Track-Rear.....54 inches.
Toe-in.....1/8 to 3/16 inch.
Camber (not adjustable).....0° ($\pm$ $1/2^{\circ}$).

To ensure correct steering it is important that the front and rear axle alignment is in accordance with Fig.259. Checks should always be carried out after damage and when the front or rear suspension have been disturbed.

centres in the rear axle, check that the readings are within the limits see Fig.259.

If not adjust to the following procedure:-

On both suspension arms release the tabwashers and remove the four bolts securing the cap. Care should be taken to avoid damaging or mislaying the gasket and shims. Check that the end of the suspension arm shaft is level with the housing which is the initial setting.

Should it be necessary to correct this setting release

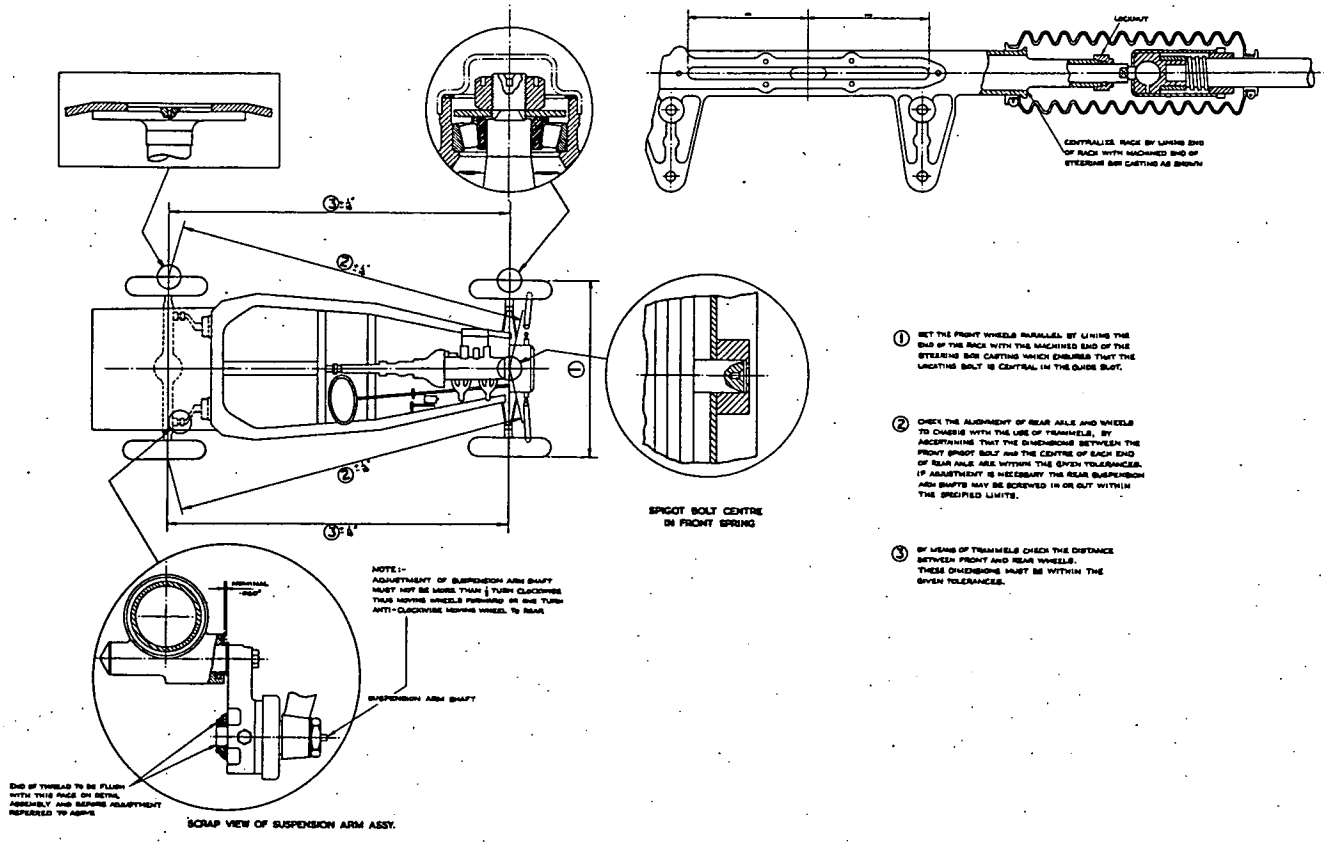


Fig. 259. Wheel alignment and tracking

To check and adjust the alignment with the car on a level surface, first remove the snap on caps from the wheels and remove the dust caps from the front hubs.

Taking a diagonal reading with trammels Fig.260 from the centre in the front spring locating bolt to the

tabwasher, remove the nut and using extractor TFN8039 break the taper joint between the suspension arm shaft and the suspension arm.

Turning the shaft with the flats provided, adjust to correct the alignment. From the initial setting position

the following should not be exceeded.

Clockwise.....Max.permissible 1/2 turn.

Anti-Clockwise.....Max.permissible 1 turn.

When correct refit the caps and reconnect the taper joints.

the front. At the same time take a parallel check from the centres of the rear wheels to the front. Fig.262.

To adjust the toe-in at the same time keeping the adjustment equal on both sides, slacken the locknut at each end of the steering rack and using the flats provided turn the ball bolt in or out as required. By using the trammelling between the front and rear wheels and

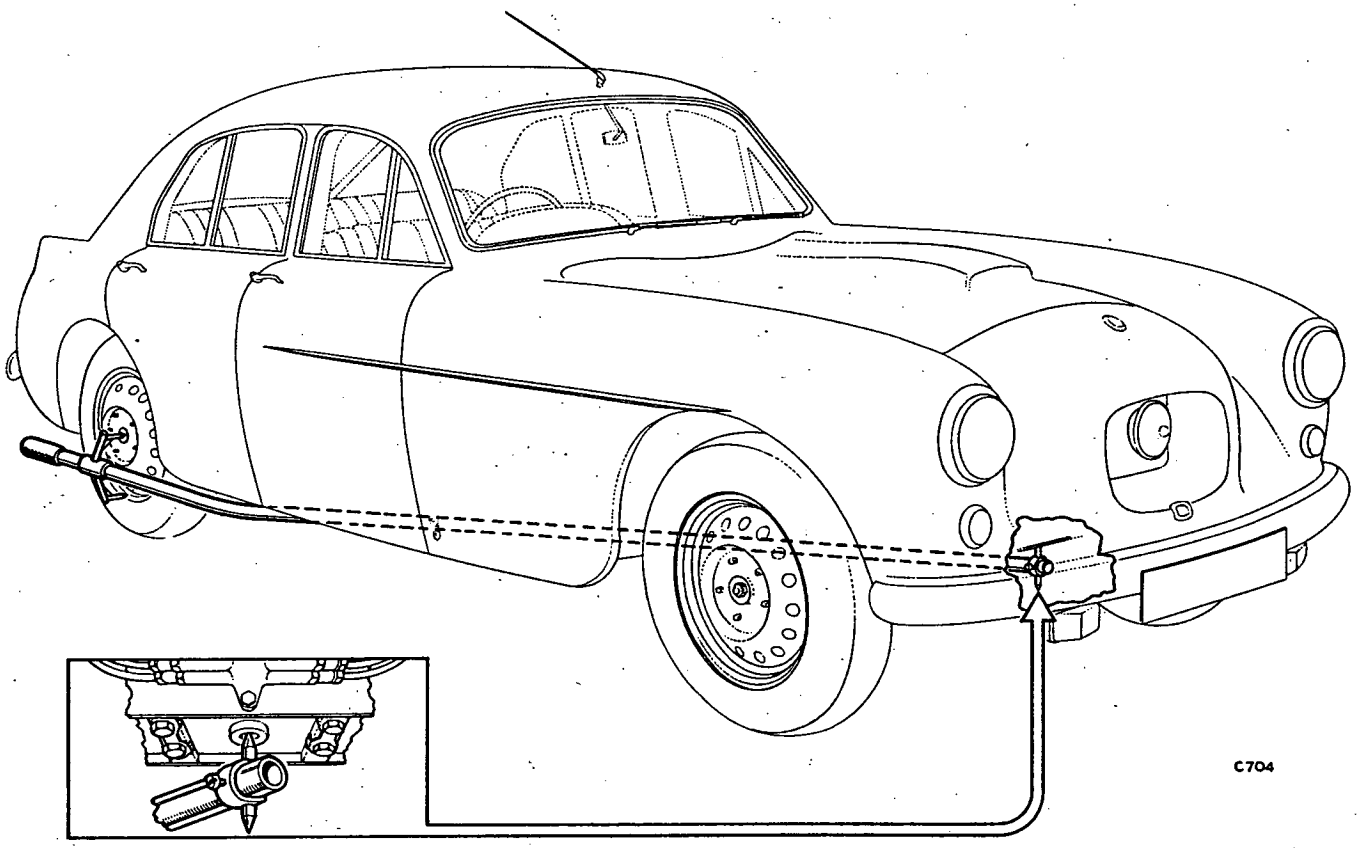


Fig. 260. Rear axle alignment

With the rear wheels aligned take a toe-in check of the front wheels. First release the clips attaching the telescopic rubber sleeves to the steering box and tie tubes and push them down the tie tubes to expose the ball joints. Centralise the steering rack by checking that the shoulder on the rack is in line with the machined end of the steering box (ie. the end farthest from the steering column). See Fig.259.

Check the toe-in Fig.261 which should read 1/8 to 3/16 inch greater at the back centre of the wheel rim than

keeping this identical on both sides of the car and at the same time checking the toe-in the correct tracking can be obtained.

It will be noted that if the toe-in has been incorrectly set from one side only then the front wheel centres would not read correct the rear wheels having already been set accurately from the front spring centre bolt.

When the front checks are satisfactory tighten the locking nuts at each end of the steering box and refit the rubber telescopic sleeves.

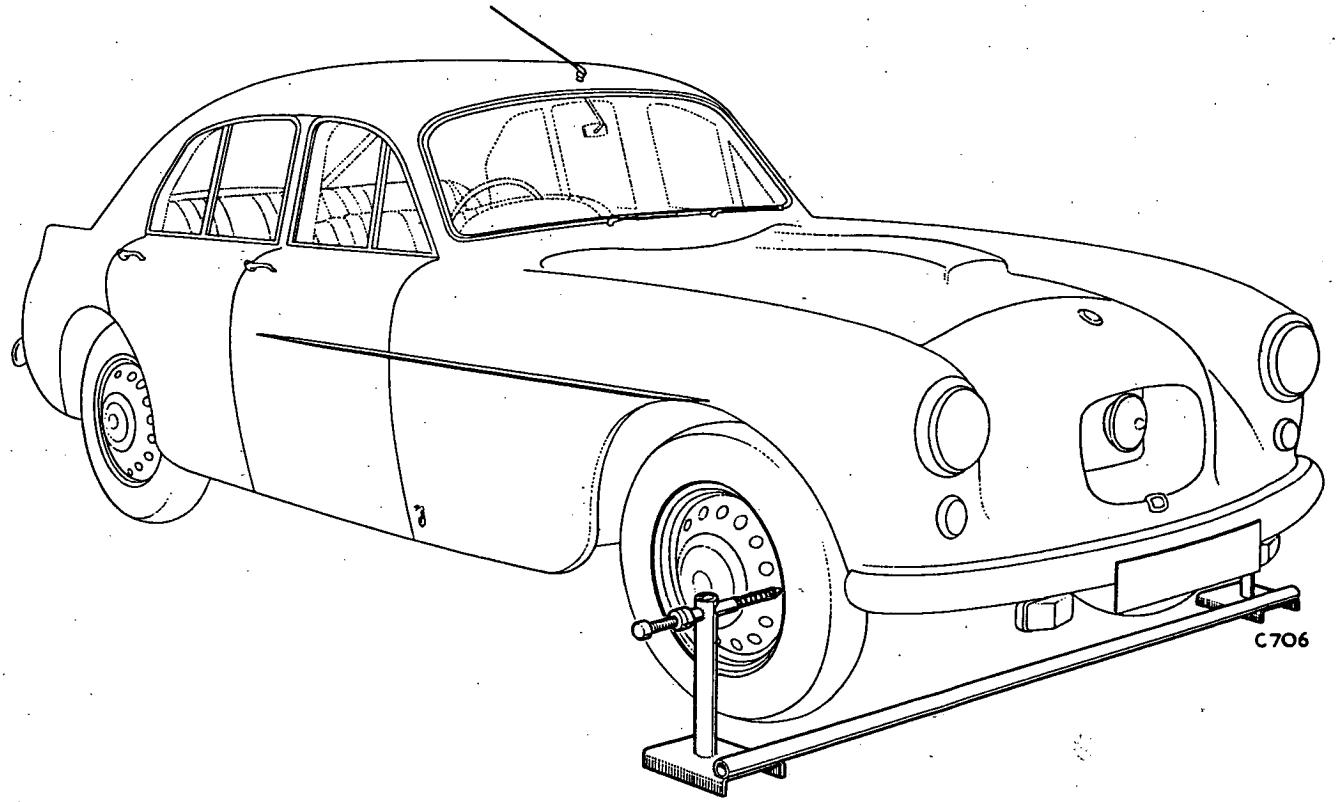


Fig. 261. Toe-in checking

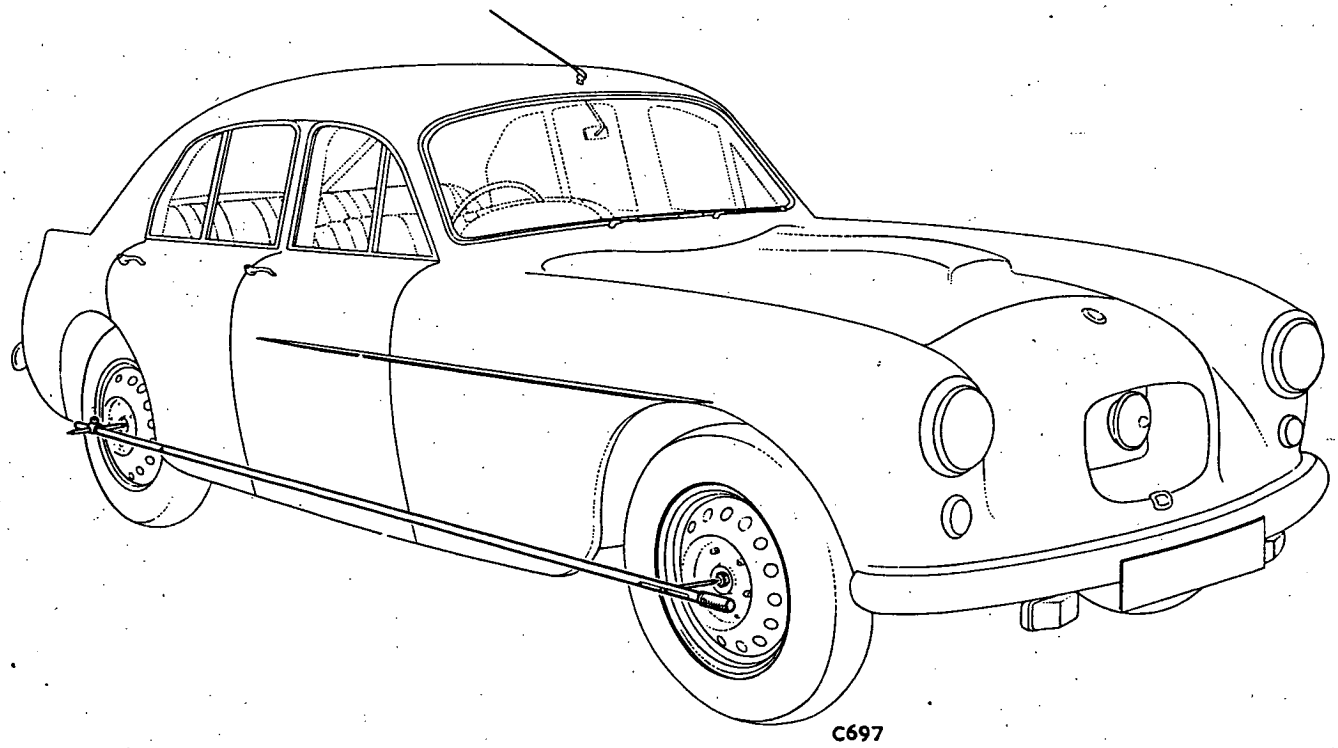
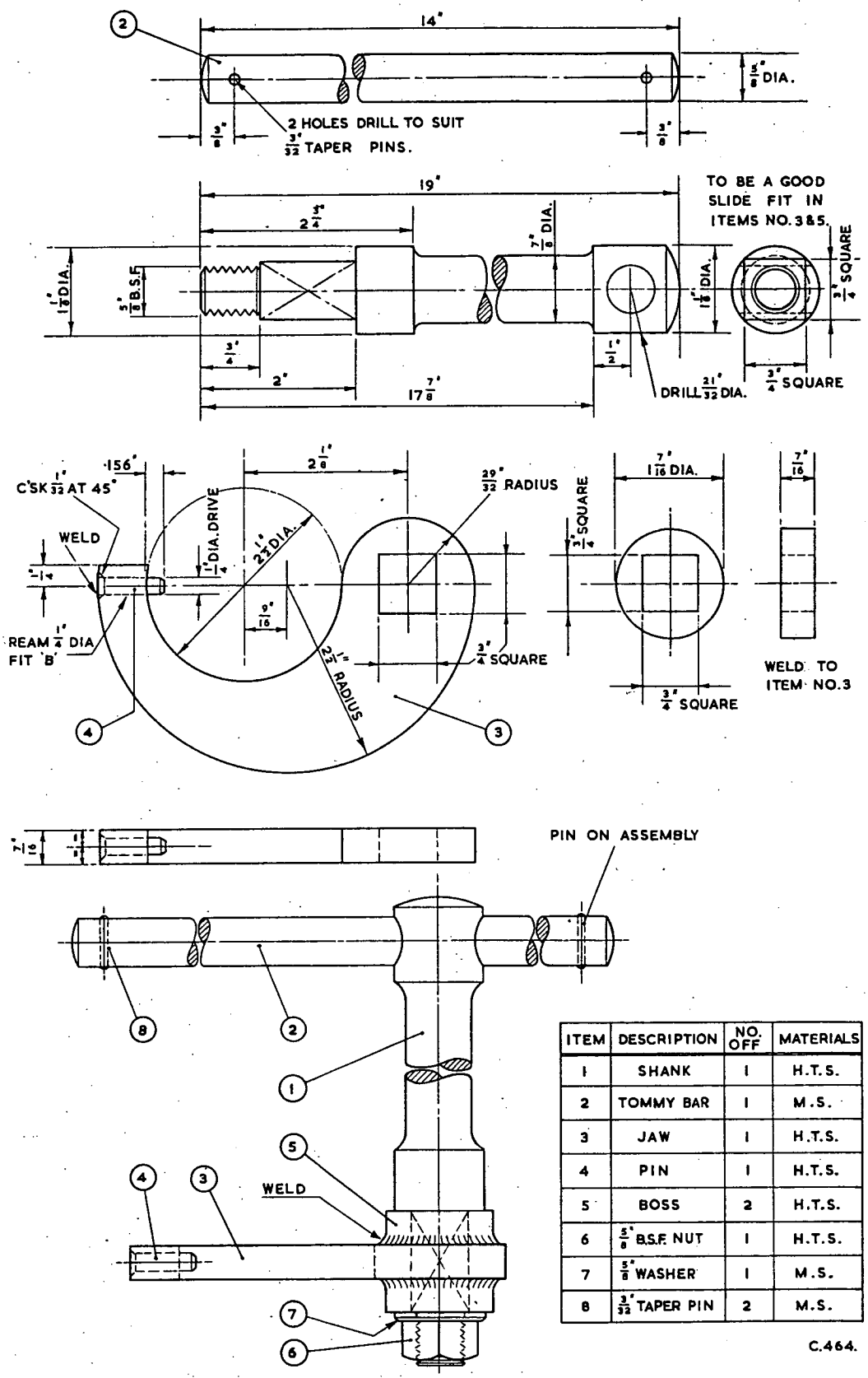


Fig. 262. Rear to front axle alignment

Special Tools

List of Contents

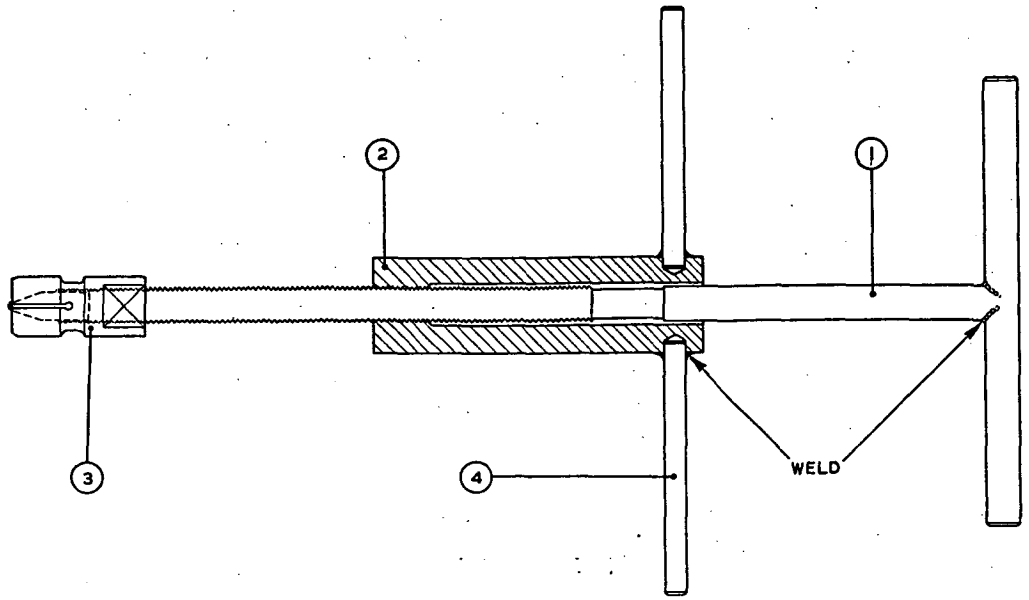
Special Tools

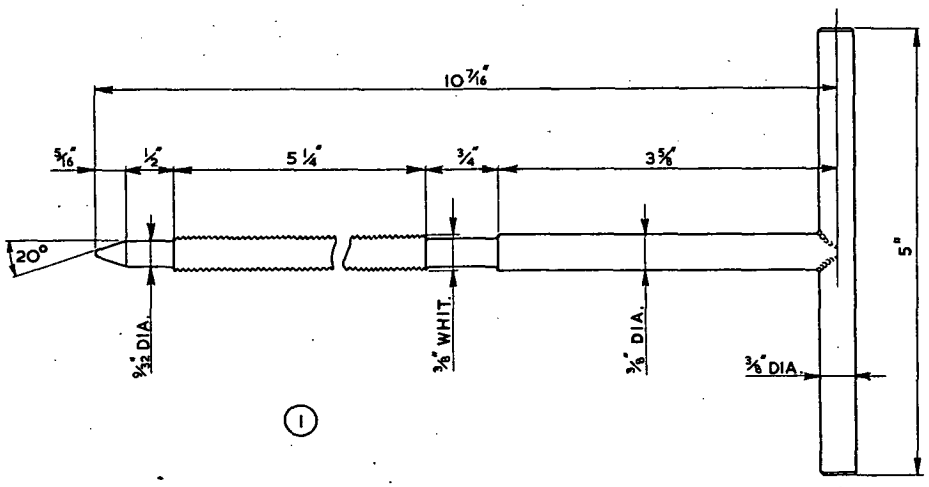


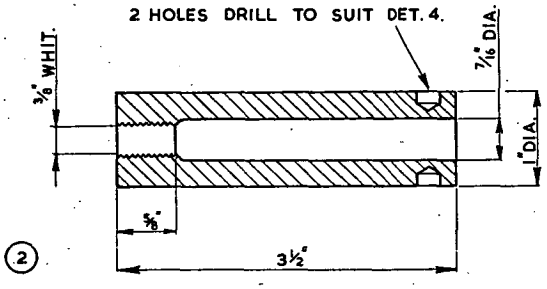
ITEM	DESCRIPTION	NO. OFF	MATERIALS
1	SHANK	1	H.T.S.
2	TOMMY BAR	1	M.S.
3	JAW	1	H.T.S.
4	PIN	1	H.T.S.
5	BOSS	2	H.T.S.
6	5/8" B.S.F. NUT	1	H.T.S.
7	5/8" WASHER	1	M.S.
8	3/32" TAPER PIN	2	M.S.

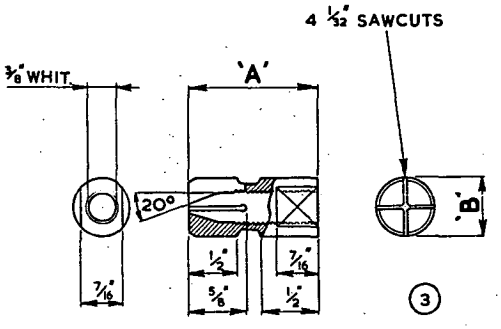
C.464.

'C' SPANNER FOR EXHAUST NUT T.F.N. 5030.





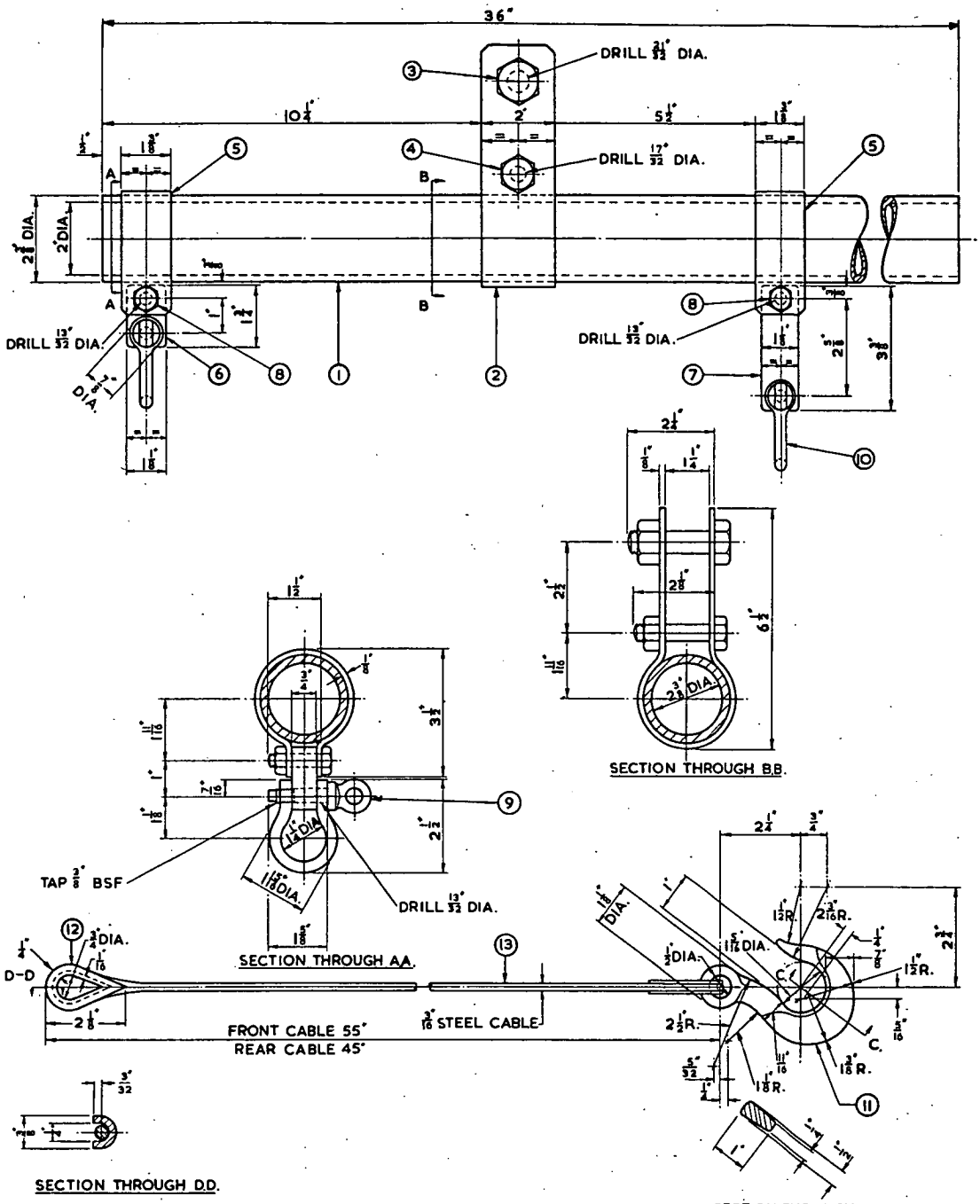




ITEM NO.	DESCRIPTION	NO. OFF	MATERIAL
1	EXPANDER BAR	1	MATERIAL TO SUIT
2	EXTRACTOR SLEEVE	1	" " "
3	COLLET	2	MILD STEEL
4	TOMMY BAR	2	MATERIAL TO SUIT

C.567.

DESCRIPTION	'A'	'B'
COLLET FOR EARLY TYPE TAPPETS.	1·250"	0·625"
COLLET FOR LATER TYPE TAPPETS.	1·200"	0·720"

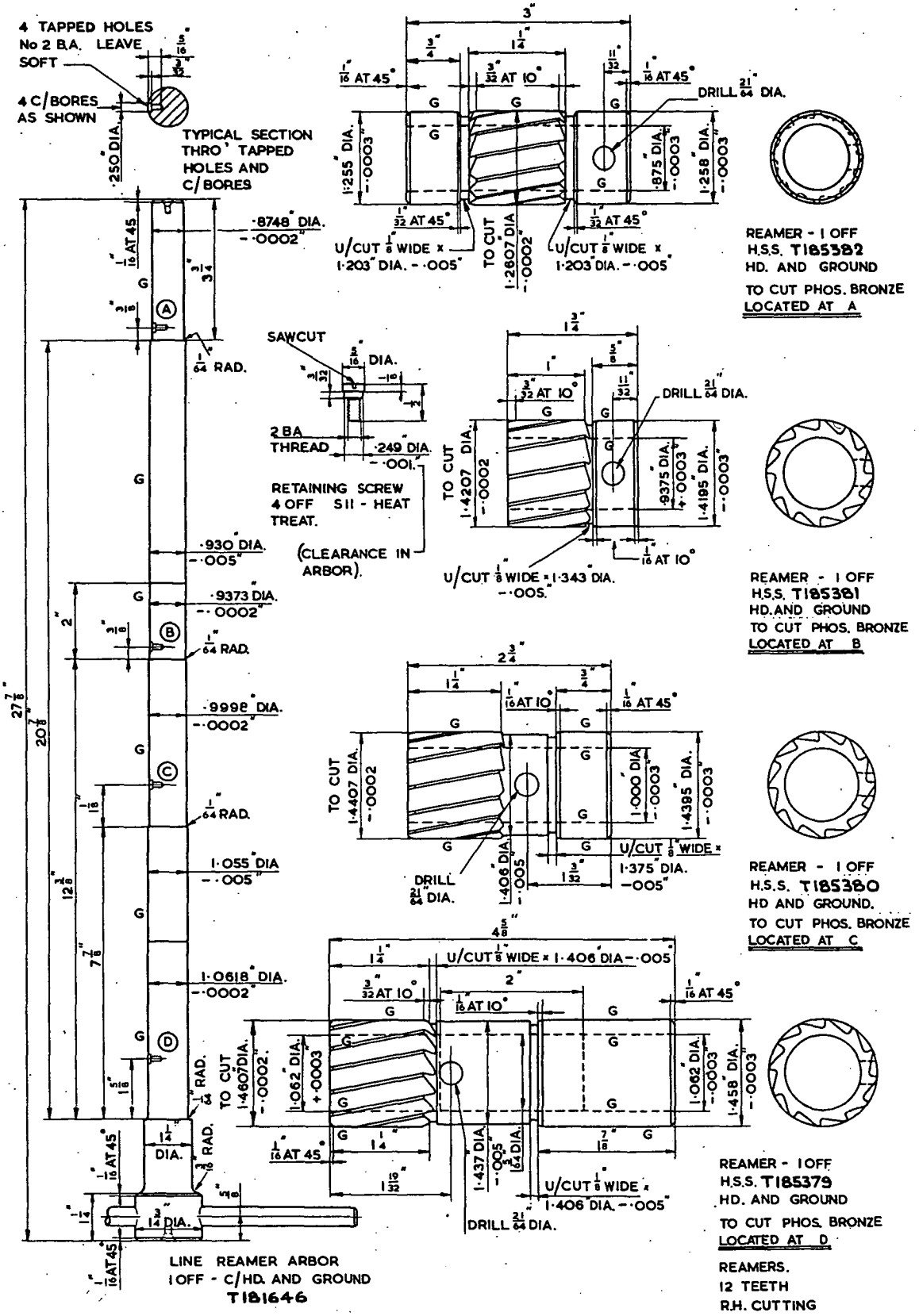


ITEM	DESCRIPTION	Nº OFF	MATERIAL
1	BEAM	1	STEEL TUBE
2	LIFTING LINK	1	M.S.
3	NUT & BOLT	1	M.S.
4	NUT & BOLT	1	M.S.
5	CLAMP	2	M.S.
6	LINK	1	M.S.
7	LINK	1	M.S.

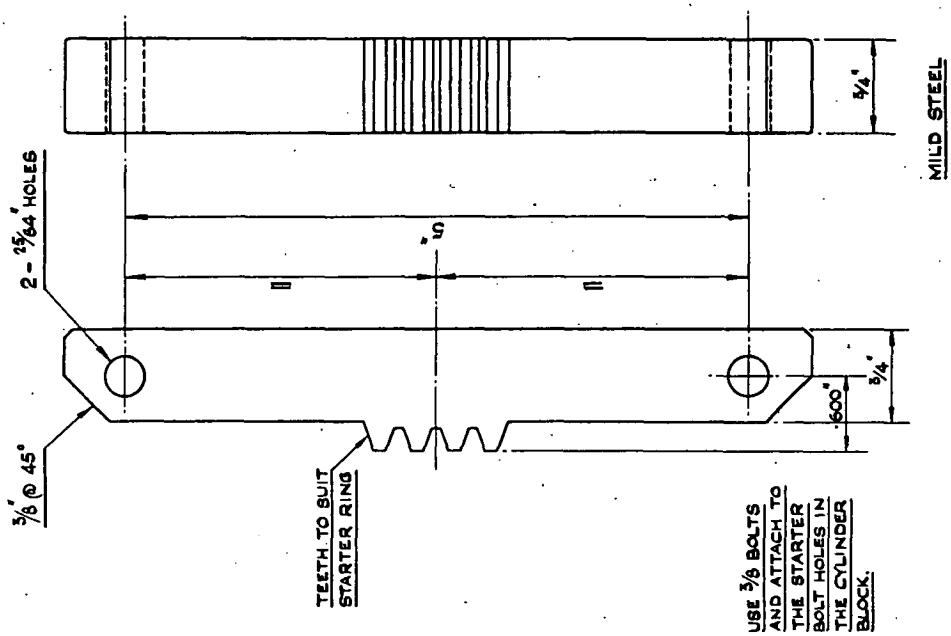
ITEM	DESCRIPTION	Nº OFF	MATERIAL
8	NUT & BOLT	2	M.S.
9	EYE BOLT	2	M.S.
10	SLINGING RING	2	M.S.
11	HOOK	2	H.T.S.
12	EYE ENDS	4	M.S.
13	CABLE	2	H.T.S.

C.466.

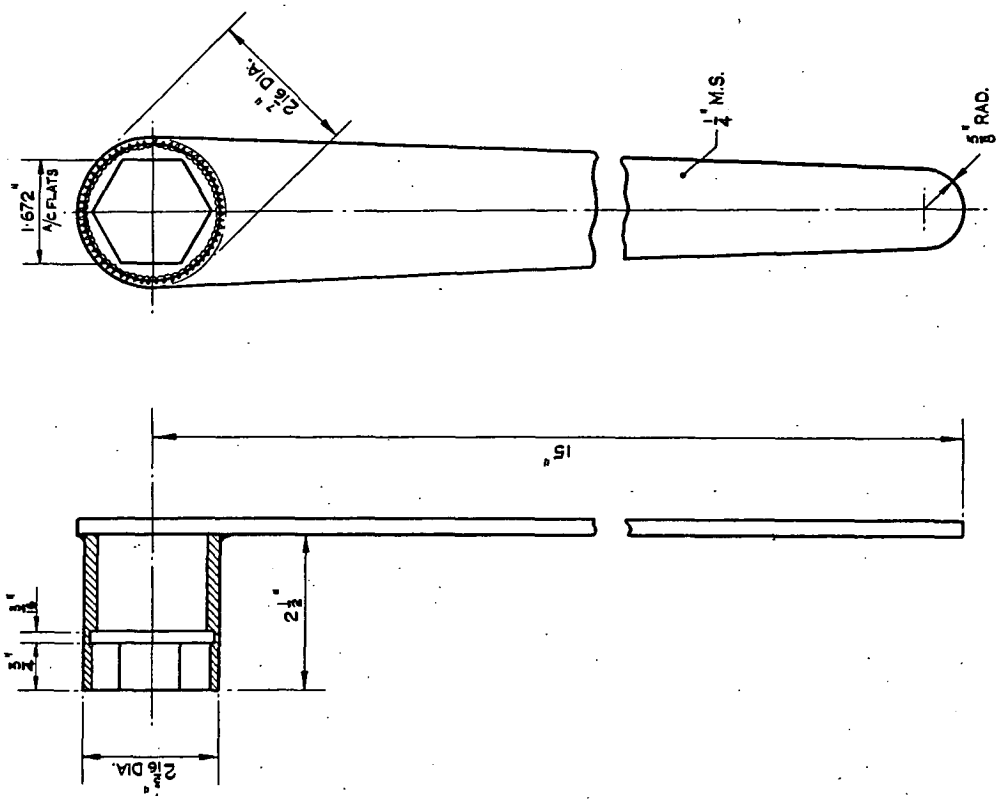
CAR ENGINE SLING T.F.N. 5029.



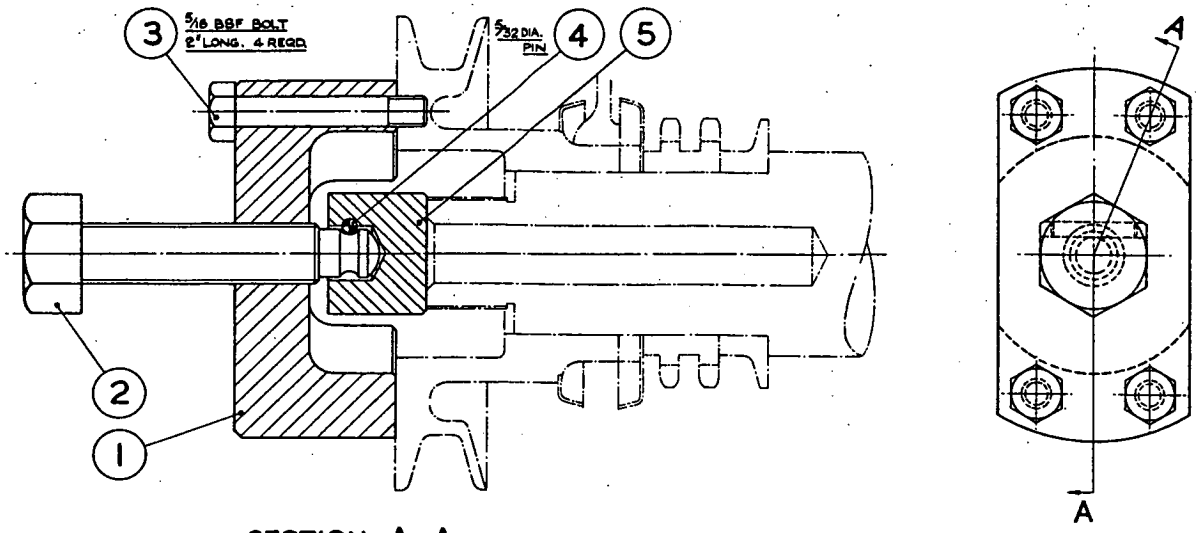
REAMER FOR CAMSHAFT BUSHES



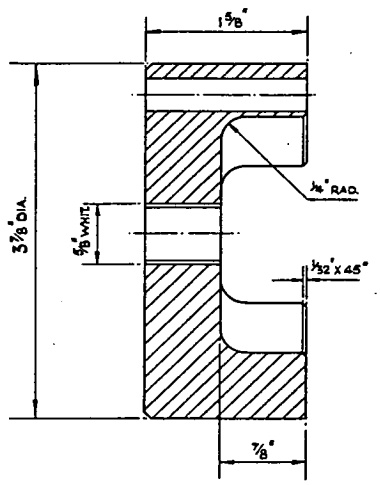
LOCKING PLATE FOR FLYWHEEL
TFN 5081



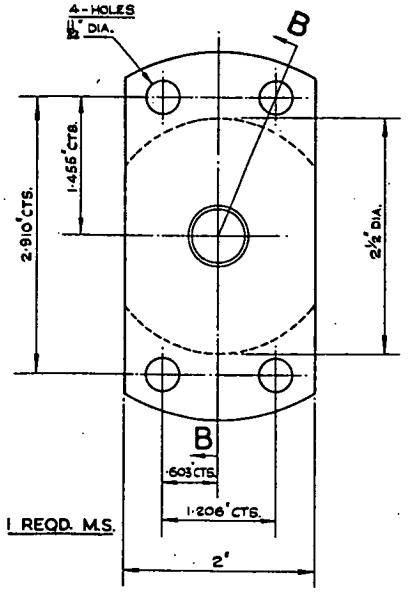
TFN. 5086. SPANNER FOR STARTER DOG.



SECTION A-A

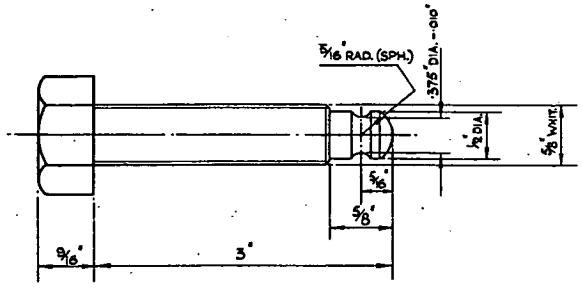


SECTION B-B

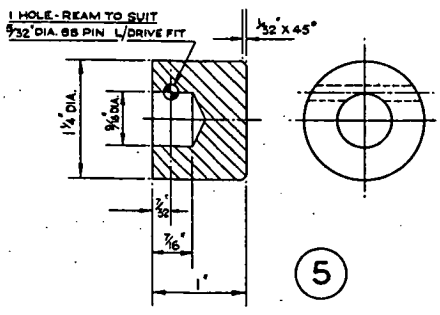


1 REQD. M.S.

(1)



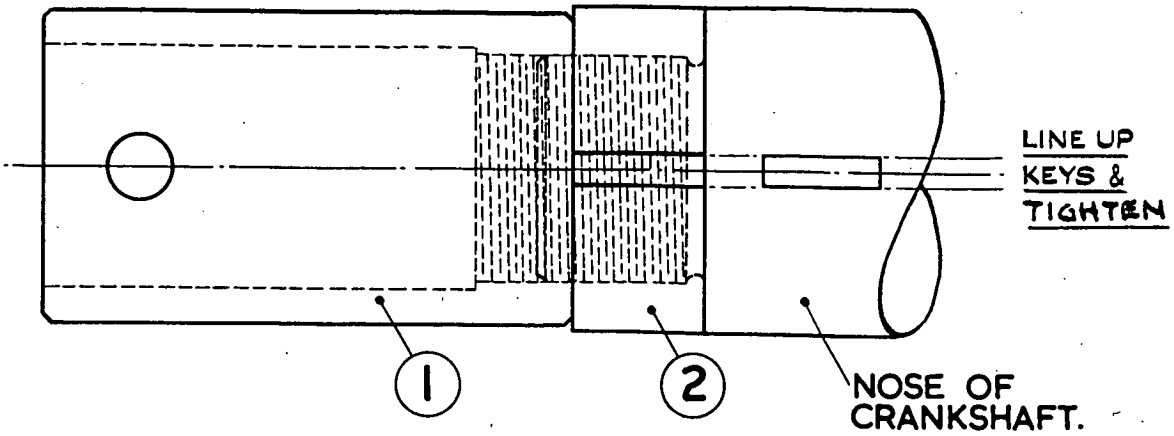
(2) 1 REQD. M.S.

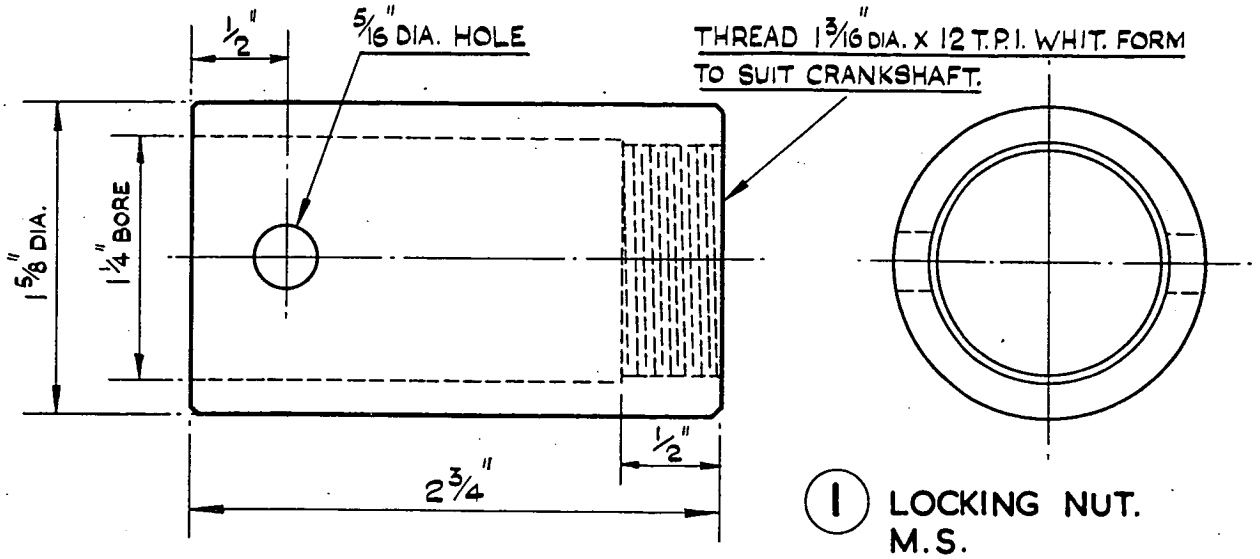


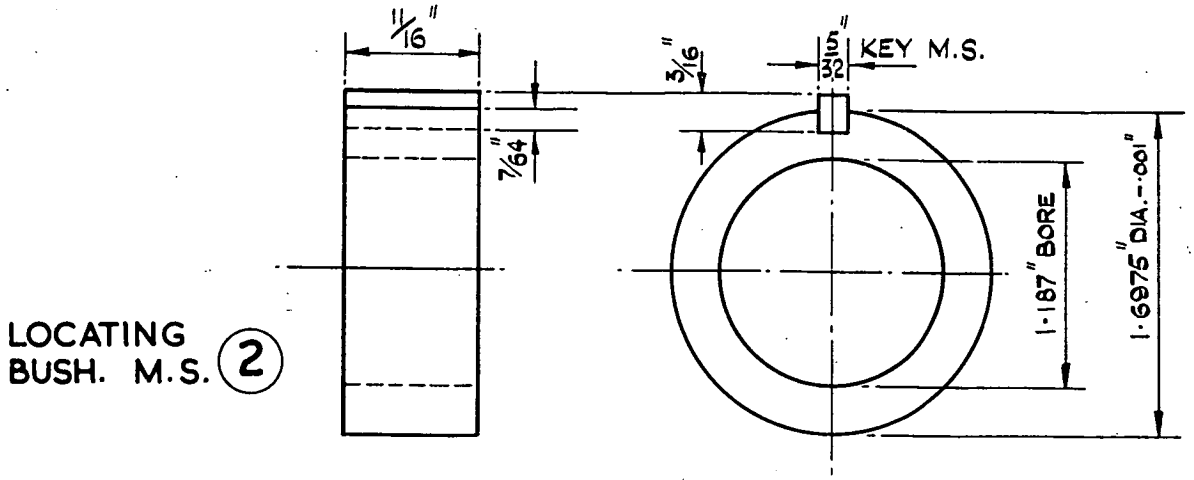
(5) 1 REQD. M.S.

DAMPER CARRIER EXTRACTOR

TFN. 5083.

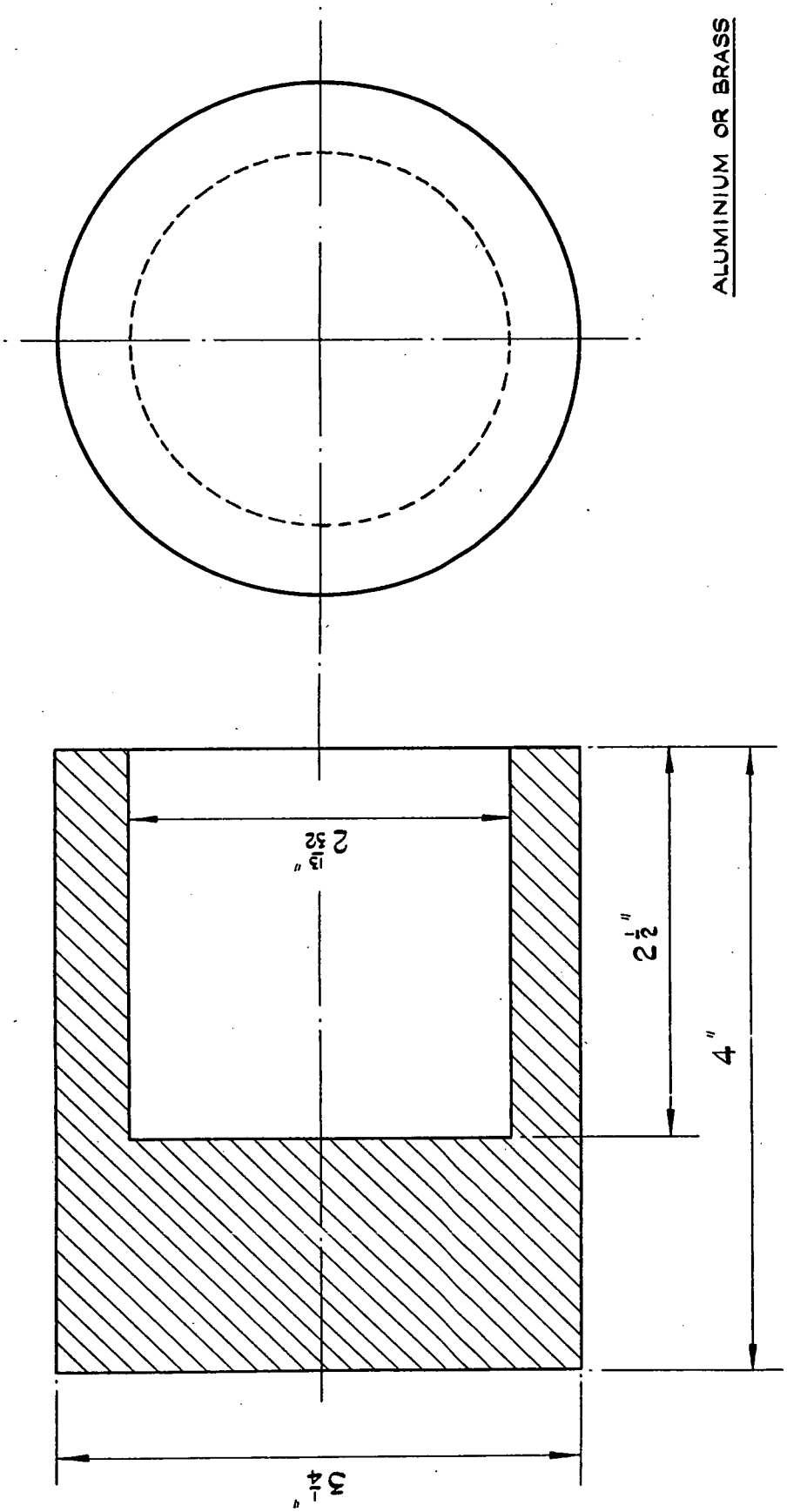






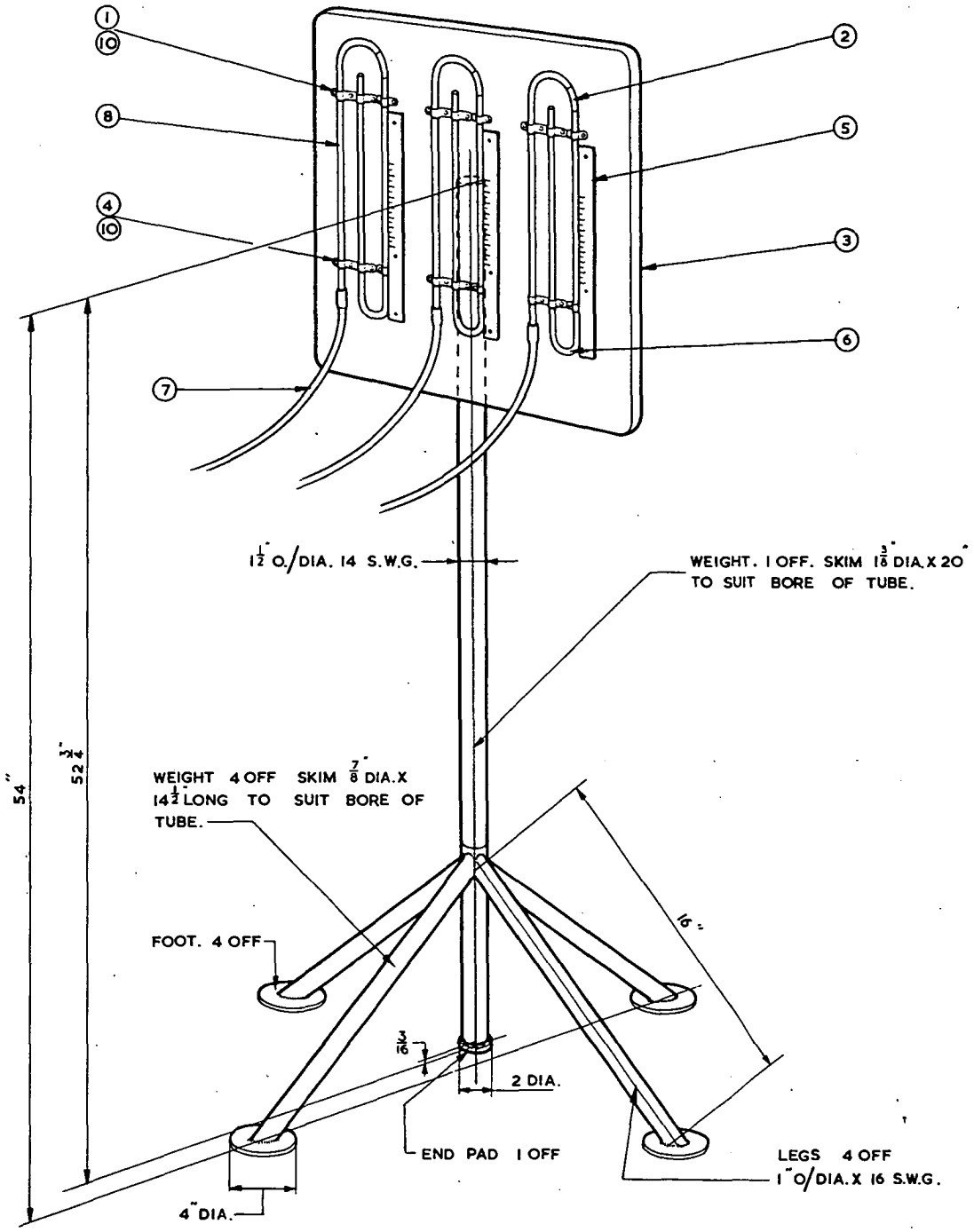
KEYED ALIGNMENT BUSH
FOR ASSEMBLY OF DAMPER CARRIER
TO CRANKSHAFT.

TFN. 5082
[TFN 20336 R&P.]



DRIFT FOR CRANKSHAFT CARRIER

TFN.5080.



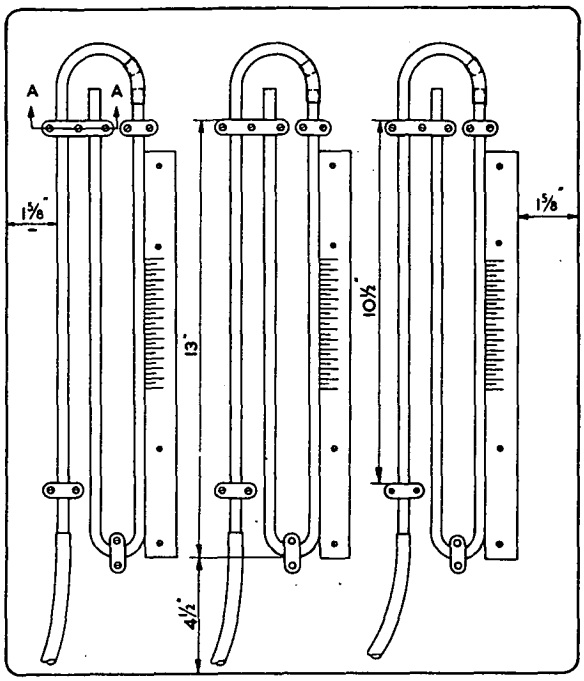
DETAIL 22 (COMPLETE)

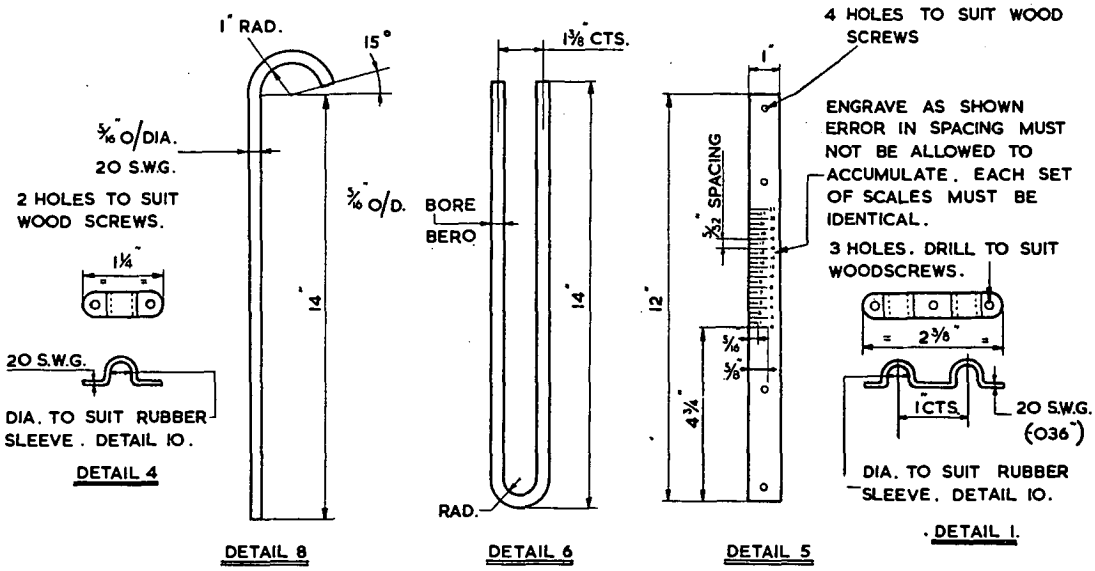
WELD AT .....

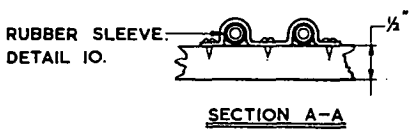
C442

	DESCRIPTION	Nº Off.	MATERIAL	REMARKS
1	CLIP	3	ALCLAD.	
2	SLEEVE	3	COM. RUBBER.	SIZE TO SUIT.
3	BOARD	1	PLYWOOD.	
4	CLIP	9	ALCLAD.	
5	SCALE	3	ALCLAD.	
6	U TUBE	3	GLASS.	5/16" O D X 1/4" BORE.
7	TUBE	3	COM. RUBBER.	6' LONG EACH.
8	TUBE	3	COPPER.	
9	WOODSCREW	62	M.S.	SIZE TO SUIT.
10	SLEEVE	12	COM. RUBBER.	SIZE TO SUIT.
11	CLIP	2	M.S.	
12	TUBE	1	M.S.	
13	TUBE	3	COPPER.	
14	UNION	3	STD. ROTHERAM.	1/4" GAS.
15	NUT	3	STD. ROTHERAM.	TO SUIT 1/4 GAS UNION.
16	NIPPLE	3	STD. ROTHERAM.	TO SUIT 5/16 O D TUBE.
17	COVER PLATE	3	ALCLAD.	
18	SCREW 2 B.A. 1/2" LONG	6	STANDARD.	CHEESE HEAD.
19	BLOCK	3	TUFNOL.	
20	JUBILEE CLIP	3	STANDARD.	SIZE TO SUIT.
21	CLIP	3	ALCLAD.	
22	STAND	1	M.S.	
23	NAME PLATE	1	ALCLAD.	
24	JET Nº 50. SLOW RUNNING	3		
25	SPARE JET POSITIONS			
26	SPARE JET POSITIONS			
27	BRACKET	3	ALCLAD.	
28	RUBBER SLEEVE	3	COM. RUBBER.	

C 442/1

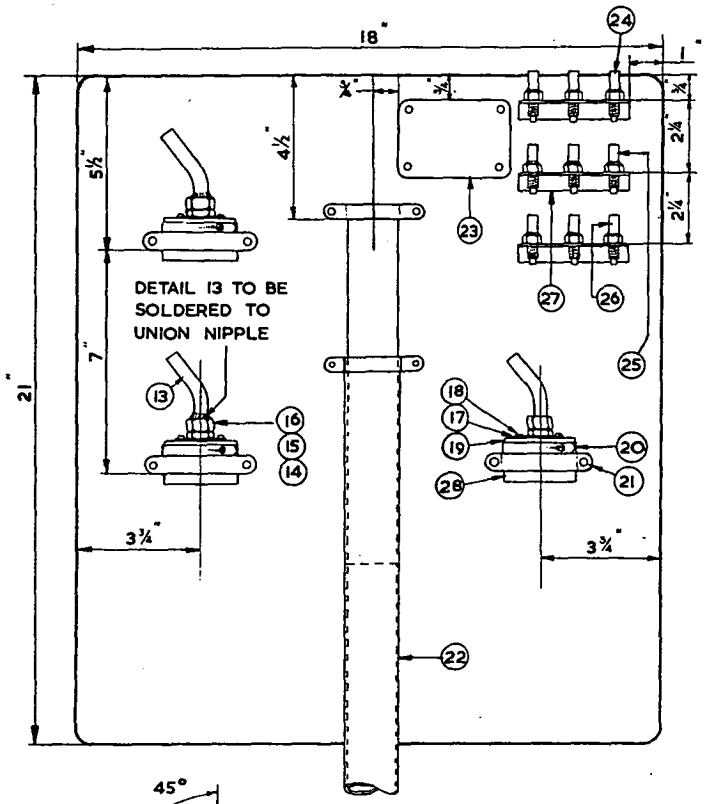


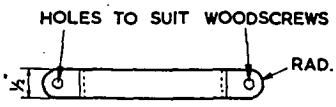


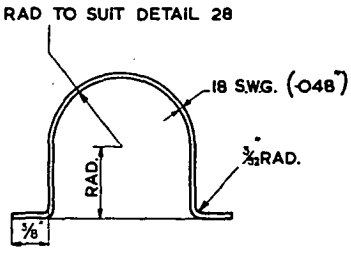


SECTION A–A

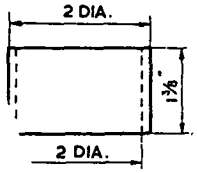
C.442/2



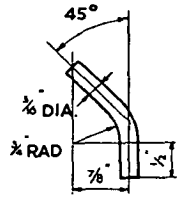




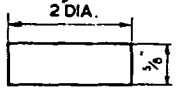
DETAIL 21

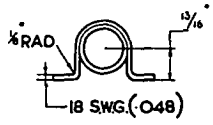


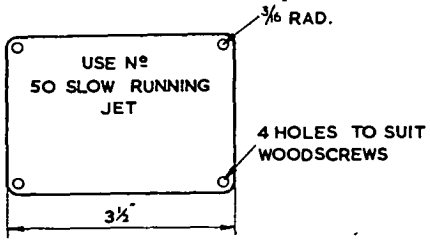
DETAIL 28



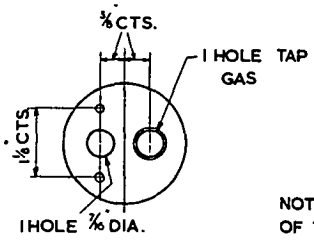
DETAIL 13 (20 S.W.G.)



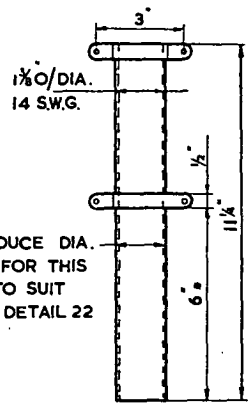




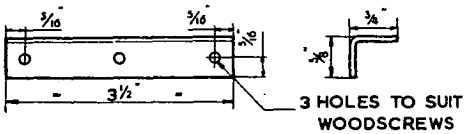
DETAIL 23 (18 S.W.G.)

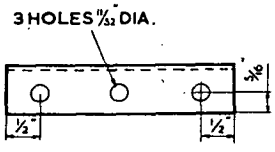


DETAIL 19

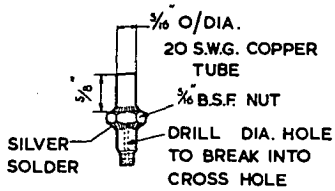


MARK ON AS SHOWN.



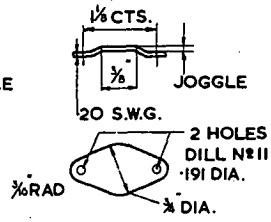


DETAIL 27



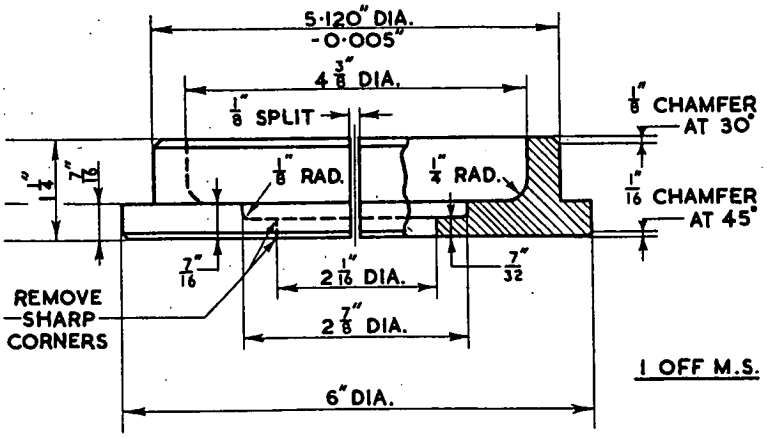
DETAILS 24, 25 & 26.

DETAILS 11 & 12 (COMPLETE)



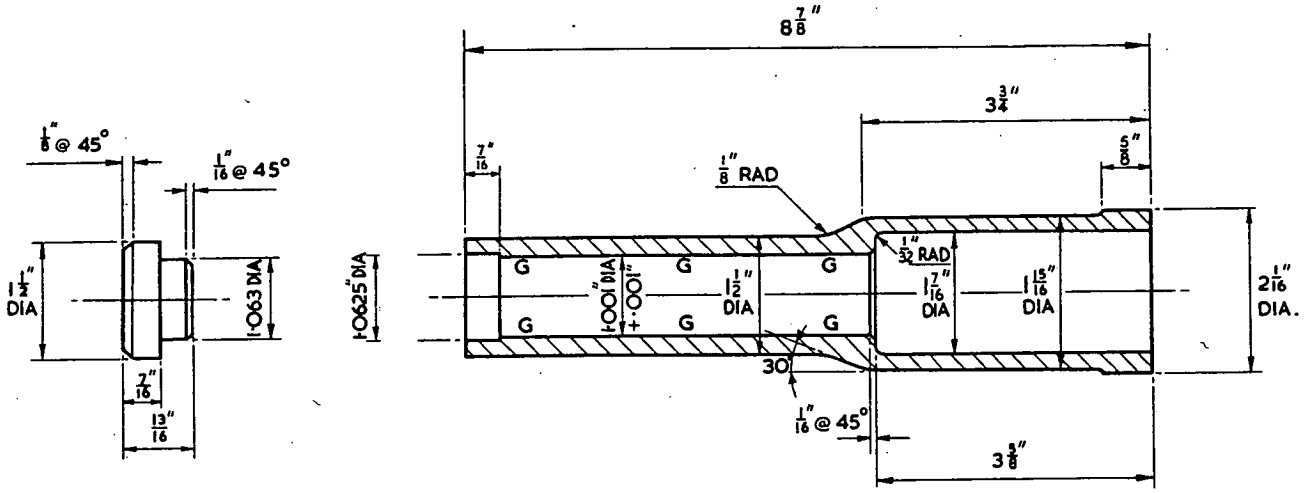
DETAIL 17

C 442/3

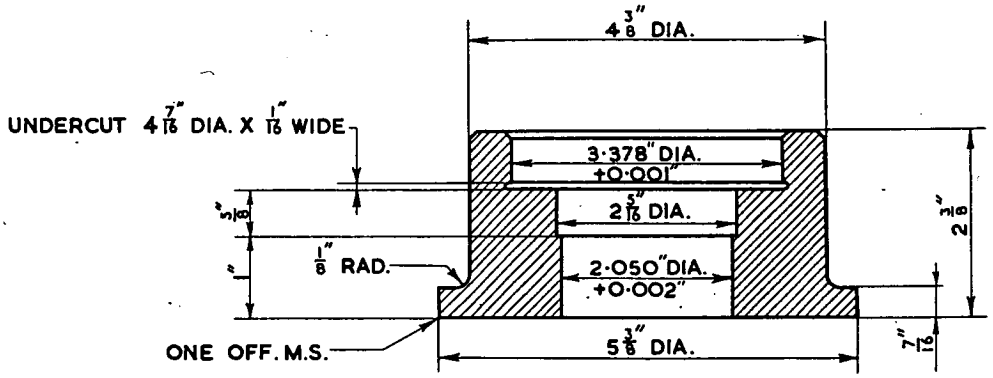


SPLIT BUSH

T.F.N. 8699



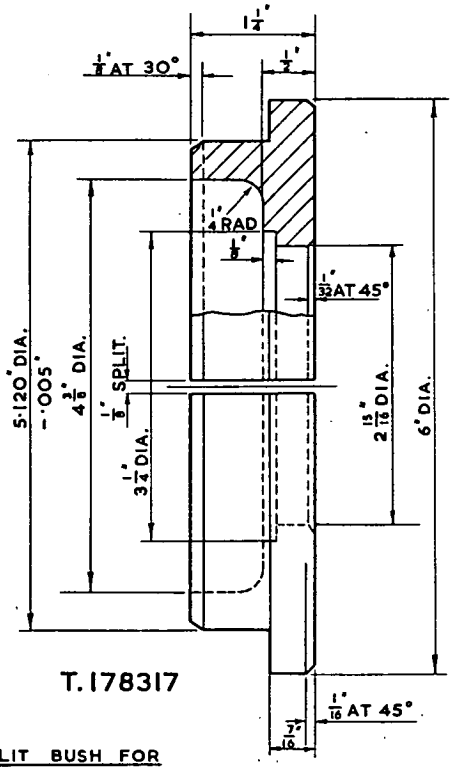
DRIFT FOR DRIVE SHAFT. T. 178299.



BASE FOR ASSEMBLING LAYSHAFT

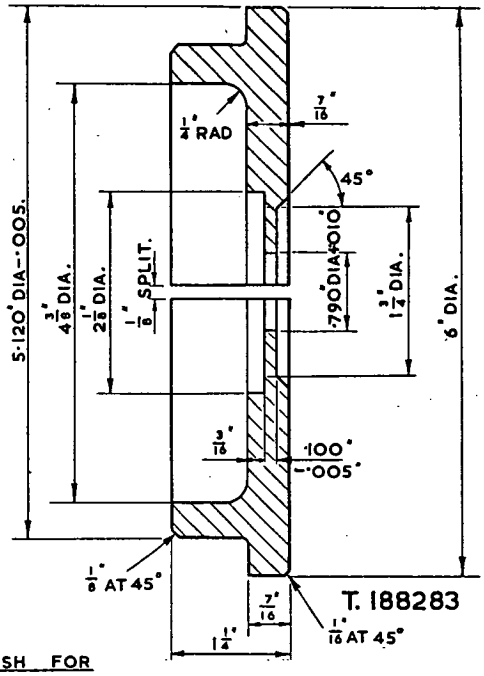
C402/5A

T. 178298



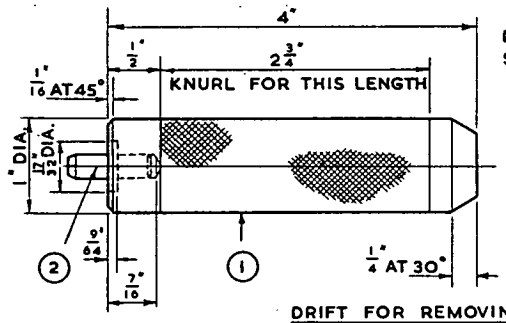
T. 178317

SPLIT BUSH FOR DISMANTLING REVERSE GEAR. 1 OFF-M.S.

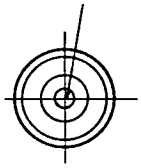


T. 188283

SPLIT BUSH FOR REMOVING REVERSE GEAR FROM LAYSHAFT. 1 OFF-M.S.

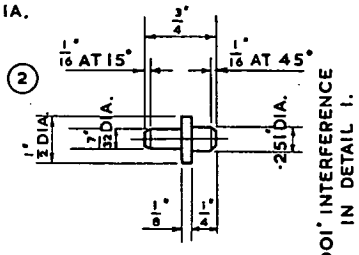


DRILL & REAM ·250" DIA. SEE DETAIL 2.

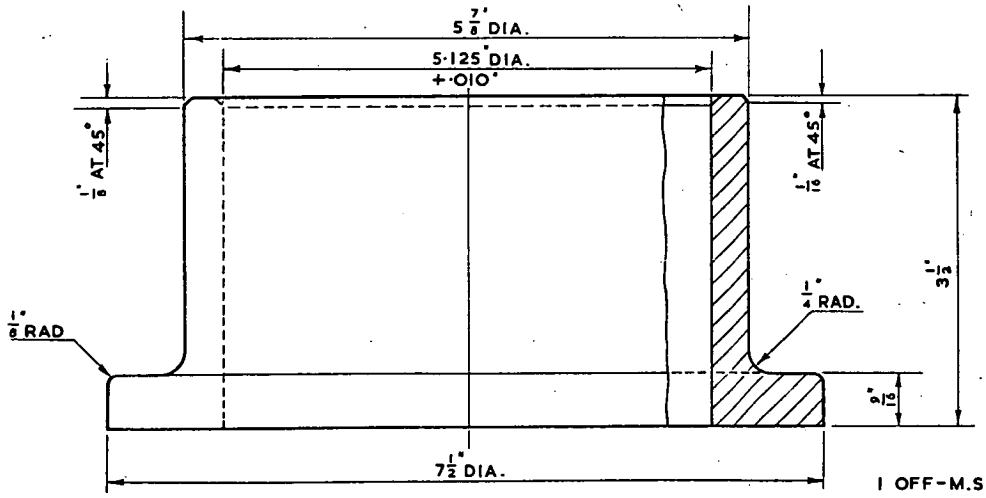


T. 178316

1 OFF-UBAS DRIFT FOR REMOVING REVERSE GEAR.



PIN. 1 OFF-S.S. HARDENED & TEMPERED

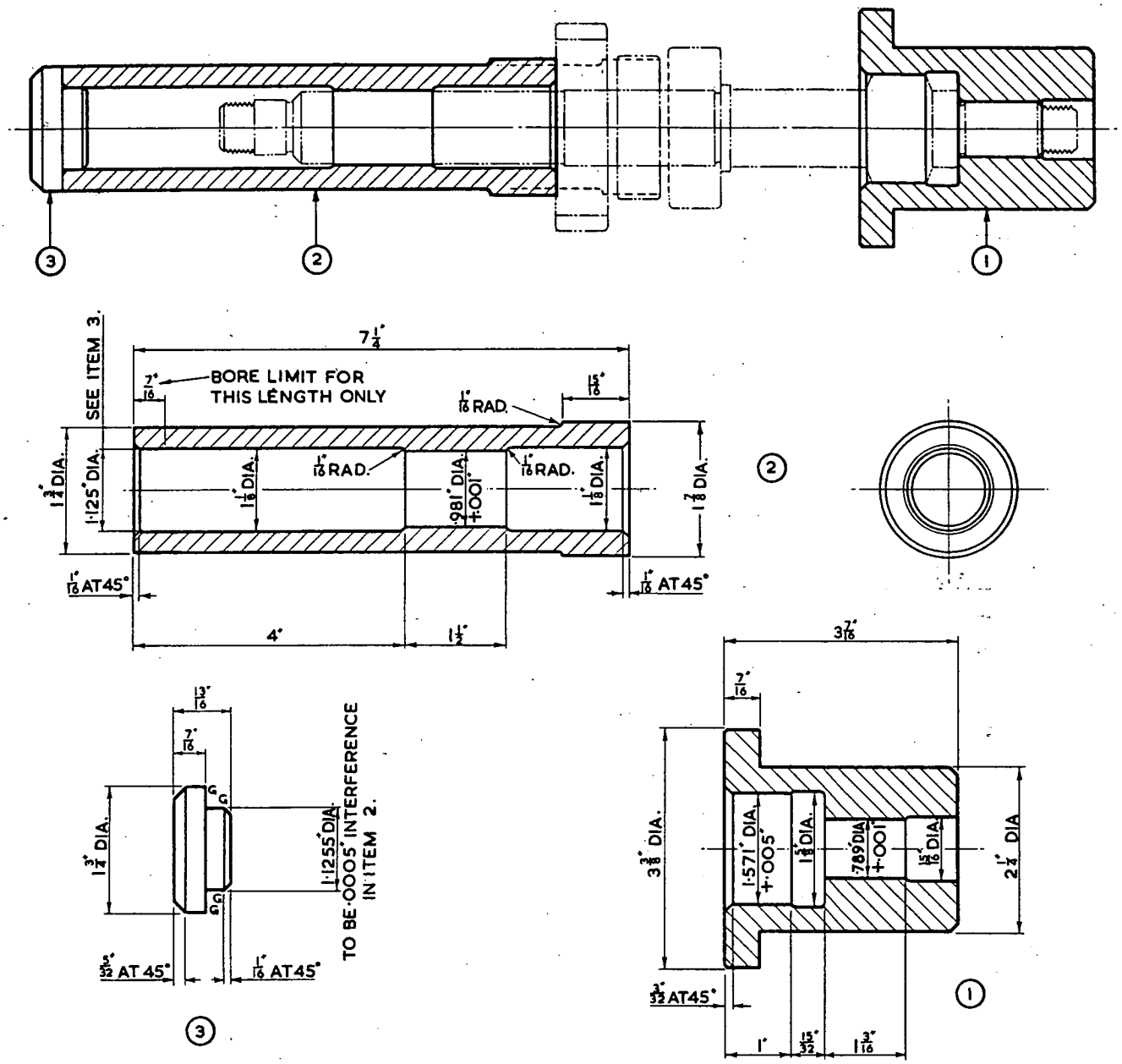


BASE FOR REMOVING REVERSE GEAR FROM MAIN DRIVE SHAFT.

1 OFF-M.S. OR C.I. M/C ALL OVER.

T. 178318

C 402/2

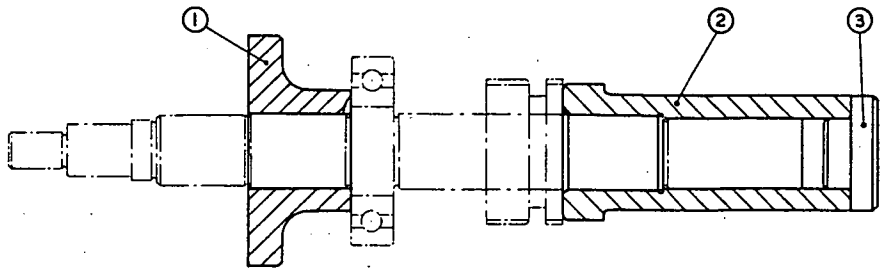


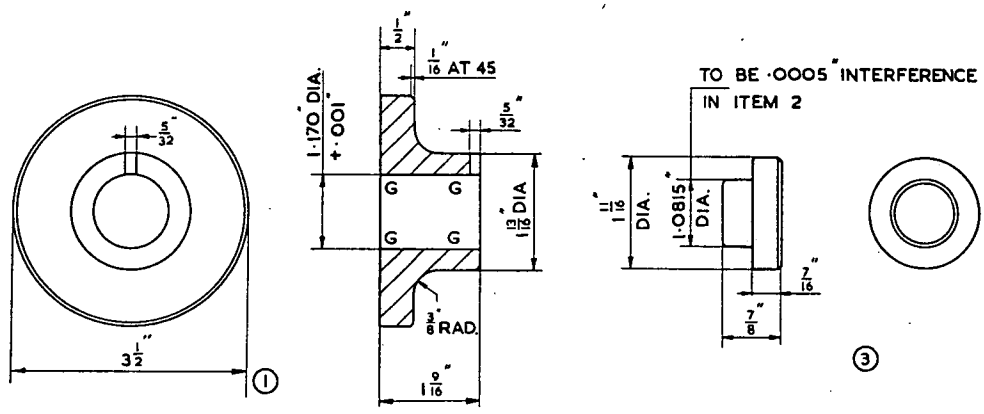
ITEM Nº	DESCRIPTION	Nº OFF	MATERIAL
1	BASE	1	MILD STEEL
2	DRIFT	1	MILD STEEL
3	PLUG	1	UBAS C.HD. & GD.

C 402/4

T.178296

TOOL FOR LAYSHAFT ASSEMBLY



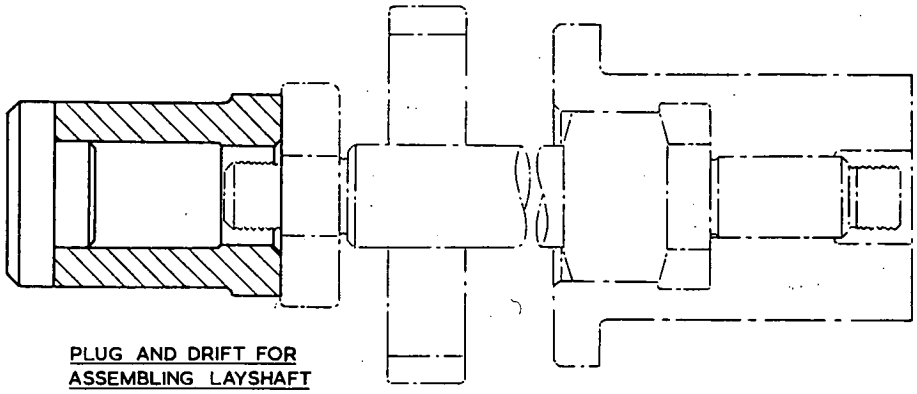


ITEM Nº.	DESCRIPTION	Nº OFF	MATERIAL
1	BASE	1	MILD STEEL
2	DRIFT	1	MILD STEEL
3	PLUG	1	UBAS C/HD. AND GROUND.

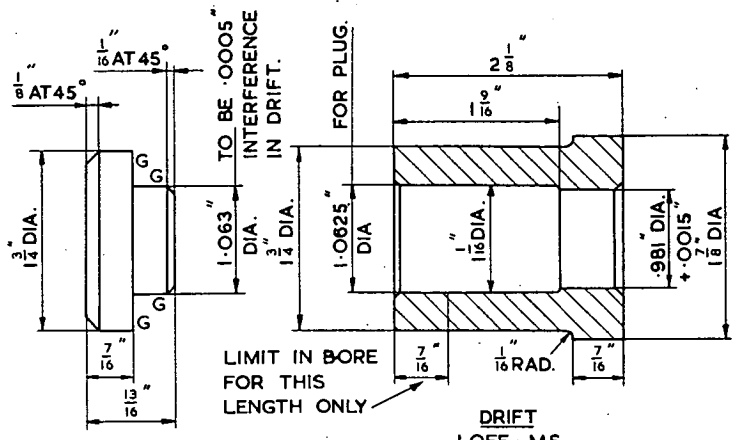
BASE DRIFT AND PLUG FOR ASSEMBLING MAIN DRIVE SHAFT COMPONENTS

C 402/3

T.178300



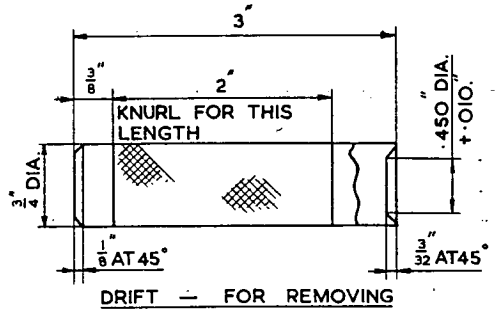
PLUG AND DRIFT FOR ASSEMBLING LAYSHAFT



PLUG
1 OFF - UBAS C/HD. AND GROUND.

DRIFT
1 OFF - M.S.

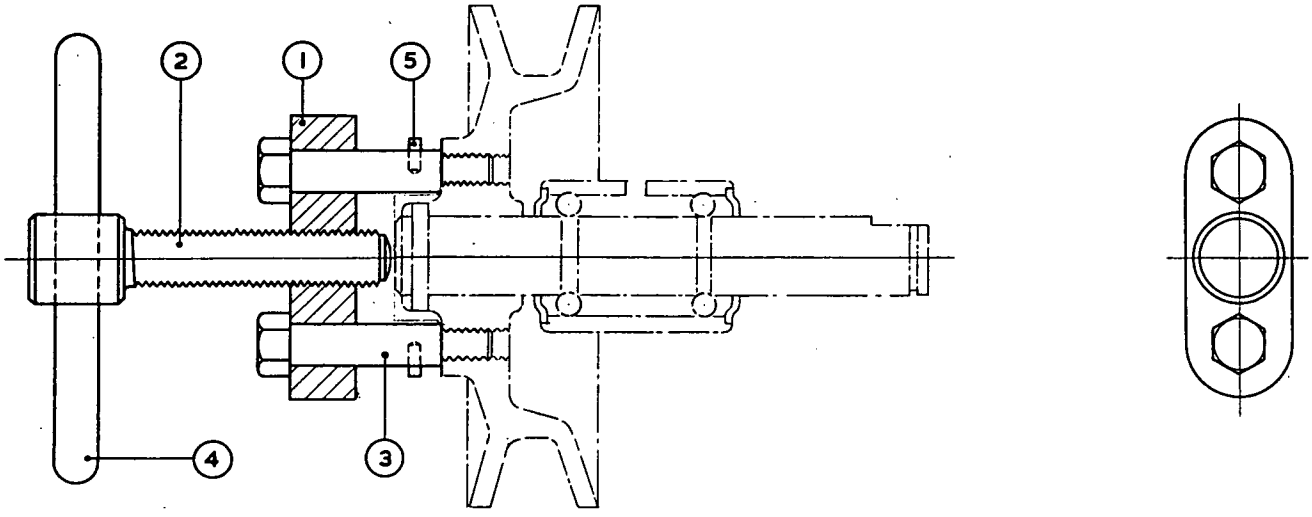
T. 178297

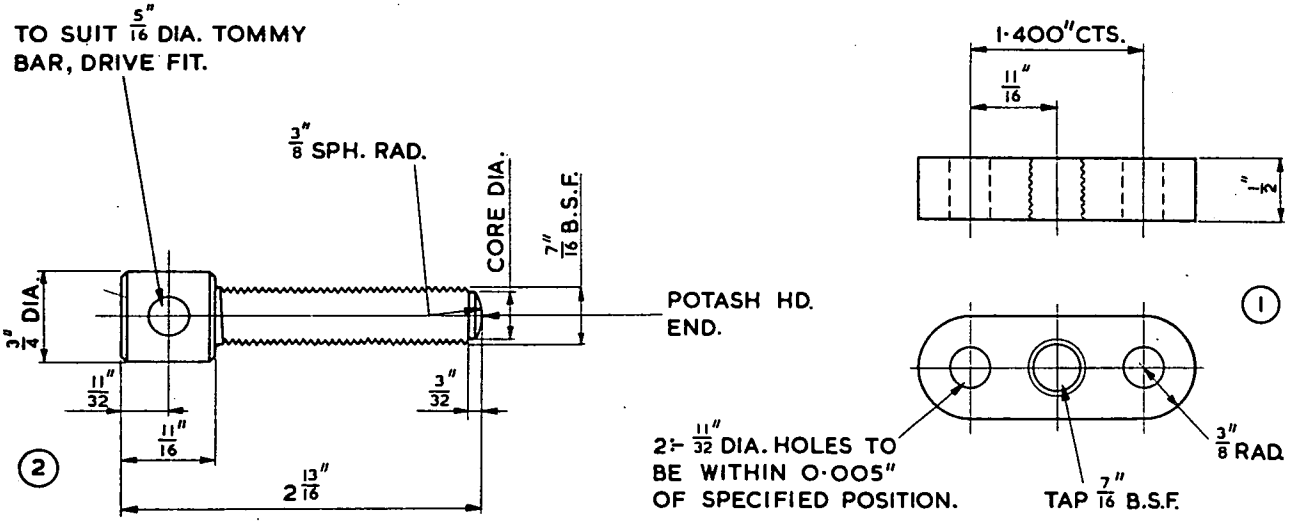


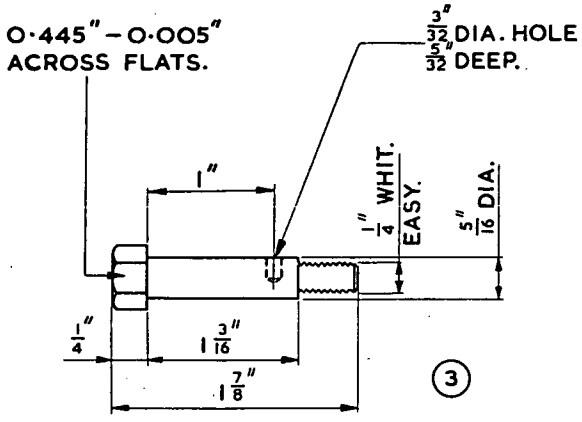
DRIFT — FOR REMOVING REAR BEARING FROM LAYSHAFT. — 1 OFF-M.S.

C 402/7

T. 178322



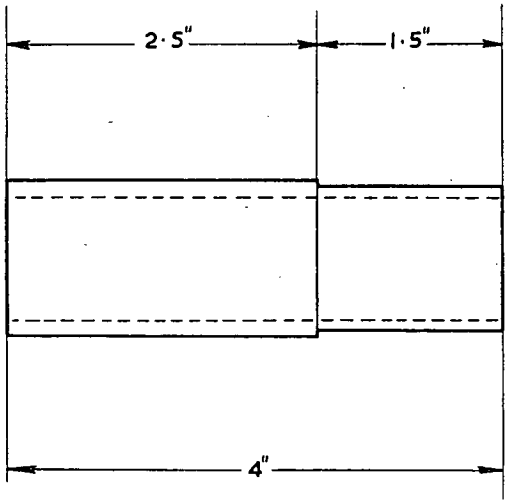


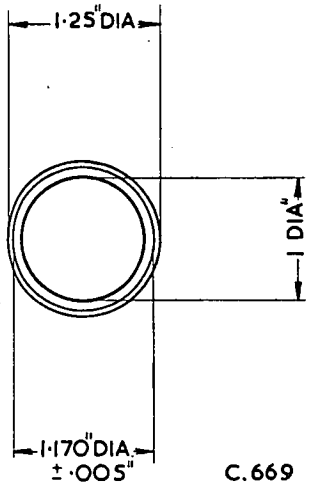


ITEM No.	DESCRIPTION	No. OFF	MATERIAL
1	LINK	1	2 3/8" X 1/2" X 3/4" M.S. 1 OFF.
2	EXTRACTING SCREW	1	2 1/2" X 3/4" DIA. M.S. 1 OFF.
3	BOLT	2	0·445" A/F X 5" LG. M.S. 1 OFF.
4	TOMMY BAR 5/16" DIA. X 3 3/4" LG.	1	M.S.
5	3/32" DIA. PIN X 1/4" LG.	2	SILVER STEEL

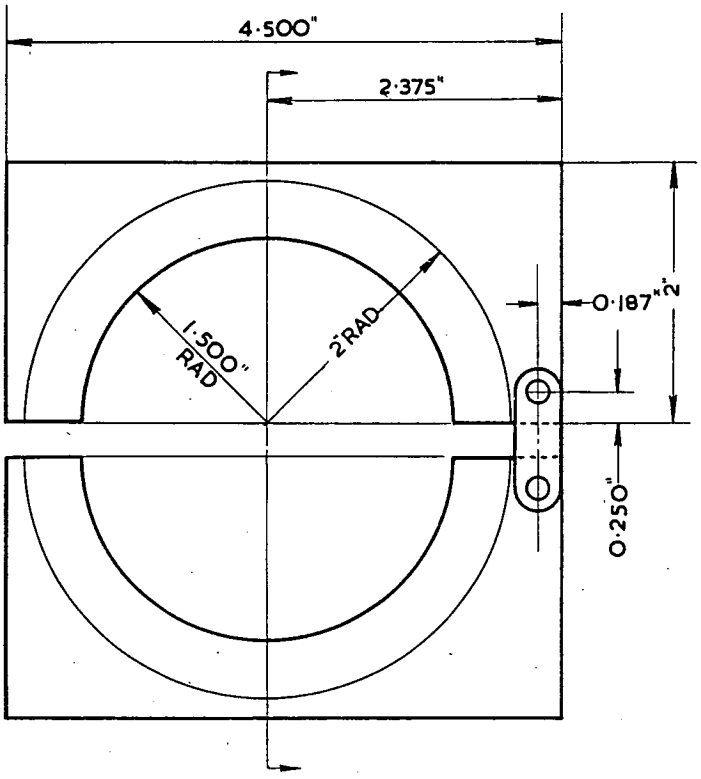
C 248

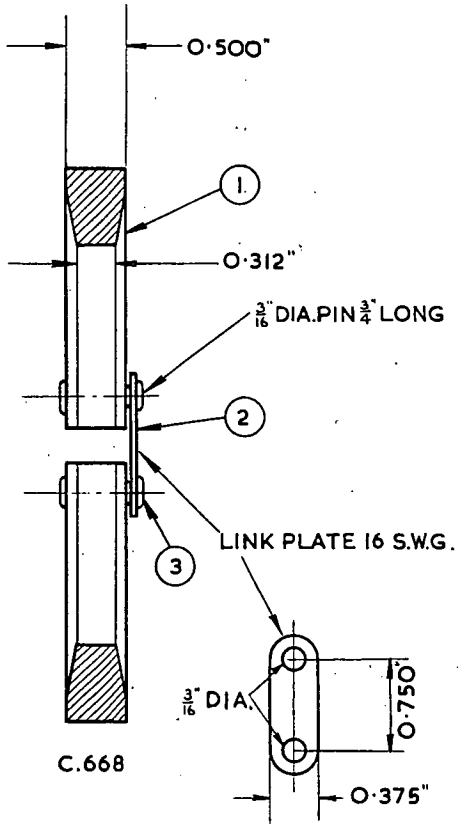
T.186444
EXTRACTOR FOR REMOVING PULLEY





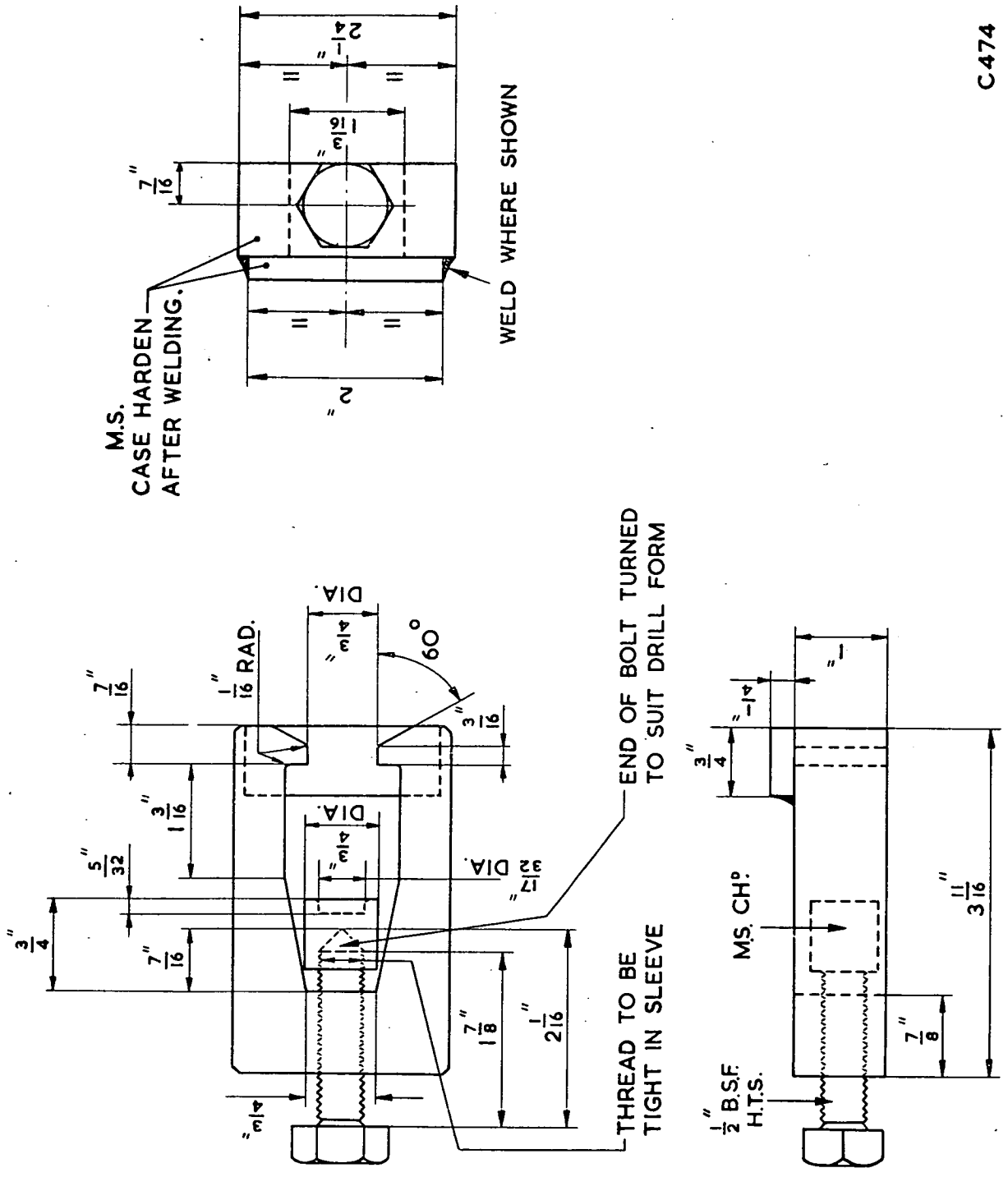
DRIFT FOR WATER PUMP BEARING AND SPINDLE

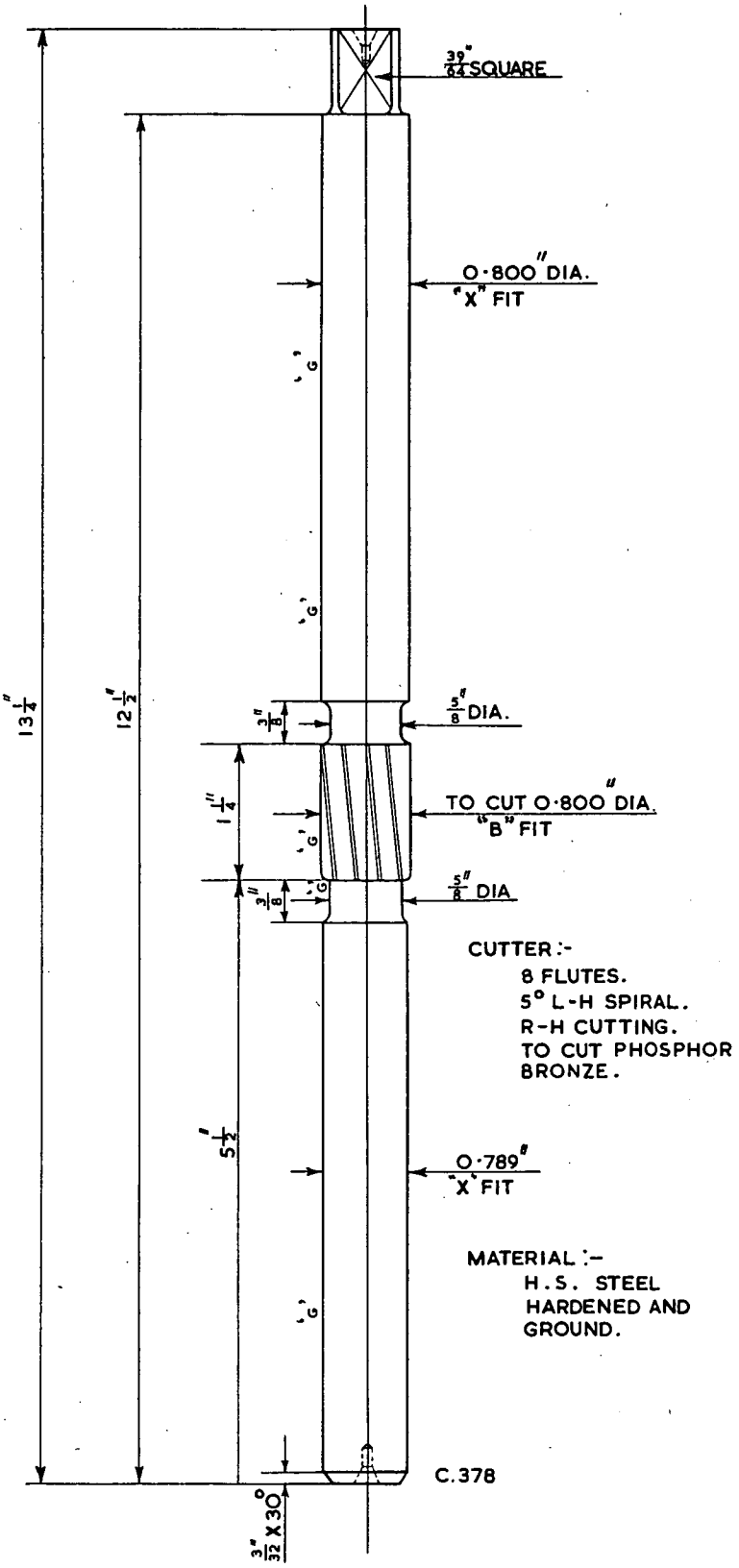




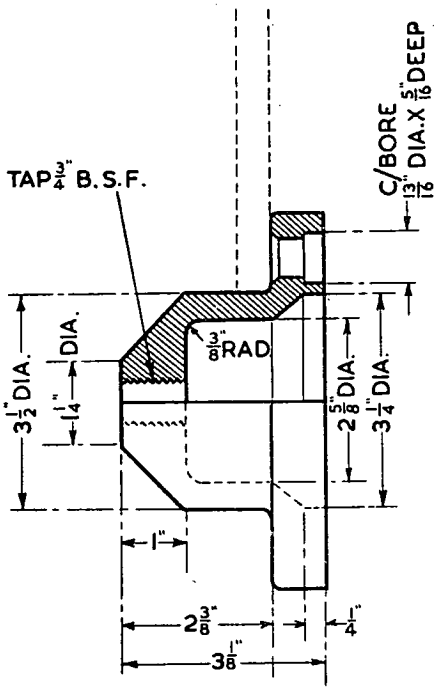
ITEM NO	DESCRIPTION	NO OFF	MATERIAL
1.	CLAMP PLATE	2.	TO SUIT.
2.	LINK PLATE	1.	" "
3.	PIN	2.	

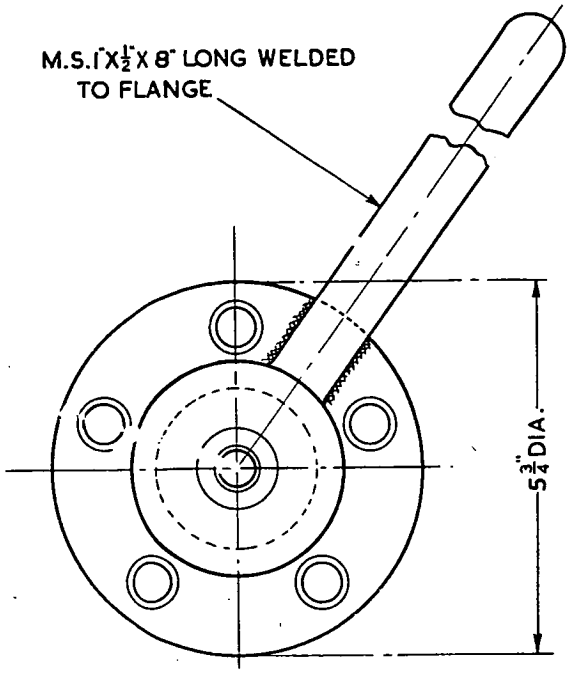
WATER PUMP VICE PLATE


C474
EXTRACTOR FOR TIE ROD & STEERING ARM T.F.N. 5006
M.S.
CASE HARDEN
AFTER WELDING.
WELD WHERE SHOWN
2 1/4"
2"
13/16"
7/16"
DIA.
1/16" RAD.
60°
3/16"
3/16"
5/32"
3/4"
7/16"
32/17" DIA.
7/8"
2 1/16"
END OF BOLT TURNED
TO SUIT DRILL FORM
THREAD TO BE
TIGHT IN SLEEVE
3/4"
M.S. CH°
11/16"
7/8"
1/2" B.S.F.
H.T.S.

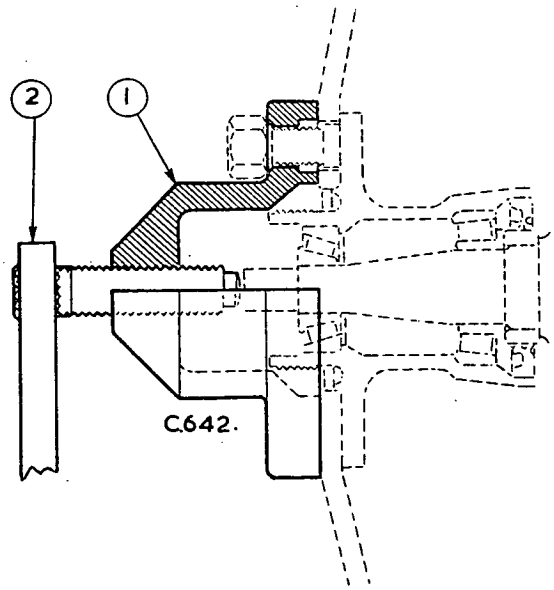


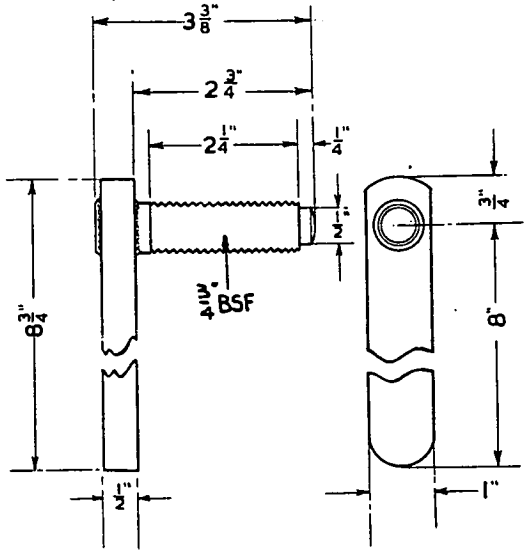
PILOTED REAMER FOR STUB AXLE BUSHES. T.F.N. 4578.





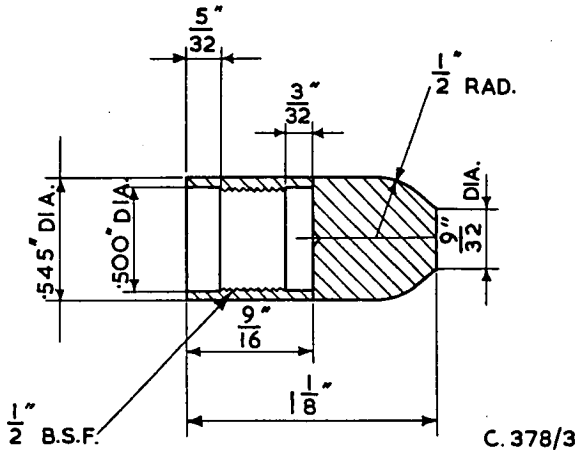
5 HOLES 21/32" DIA. EQUALLY SPACED ON 4·410" P. C. DIA. AND C/SUNK 30°





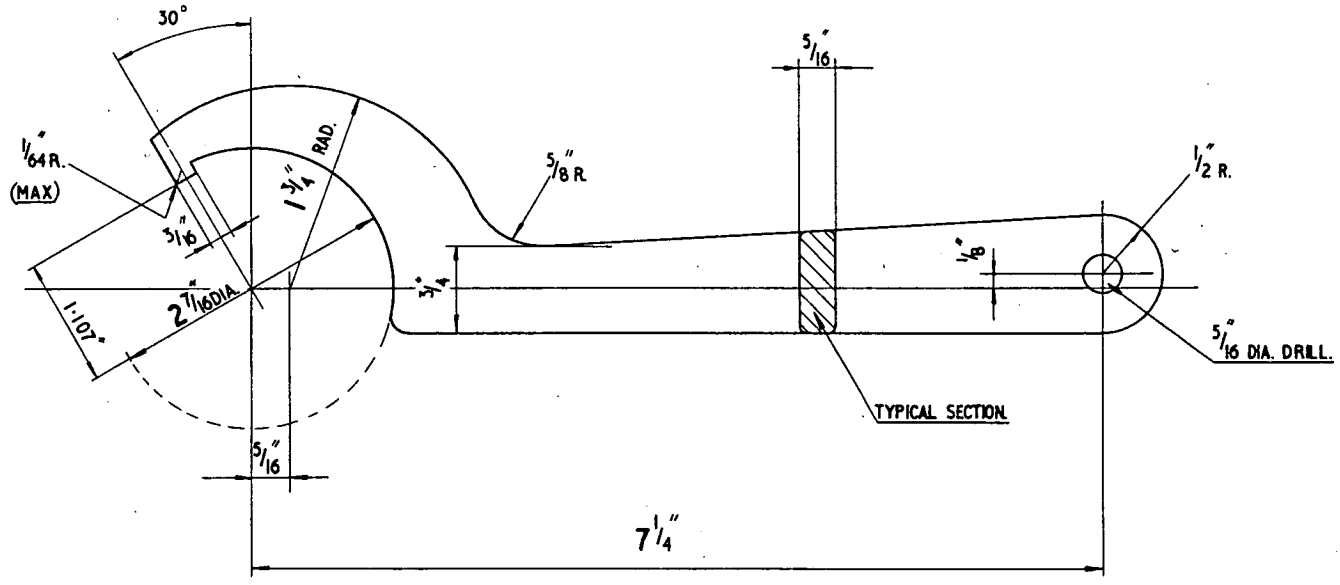
ITEM NO.	DESCRIPTION.	NO. OFF.	MATERIAL.
1	BODY	1	M.S.
2	EXTRACTOR	1	M.S.

FRONT HUB EXTRACTOR TFN 5009/A

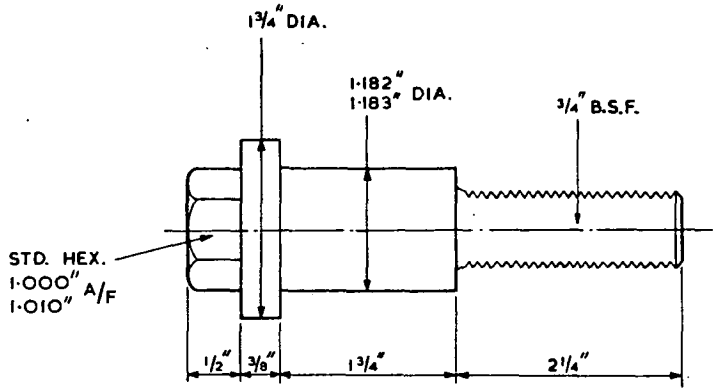


M.S.
CASE-HARDEN

THREAD PROTECTOR AND LEAD-IN T.F.N. 5001



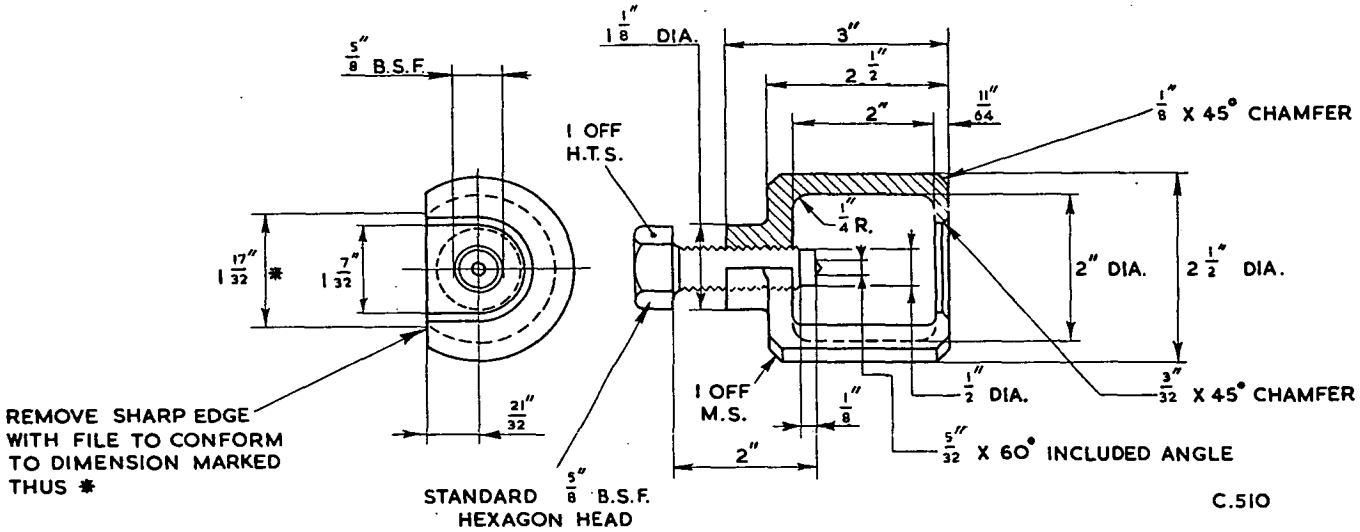
'C' SPANNER TFN 5028



MILD STEEL. SKIN HARDEN.

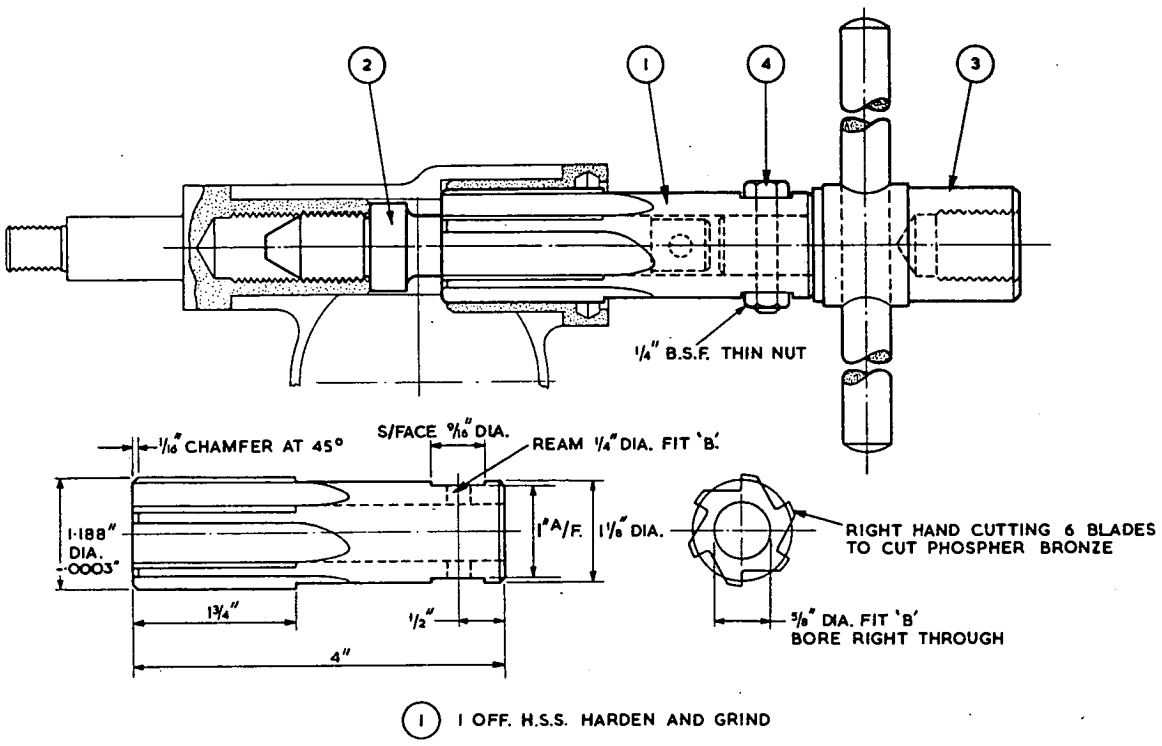
C.462

INSERTING TOOL FOR REAR AXLE BUSHES. TFN.5067.

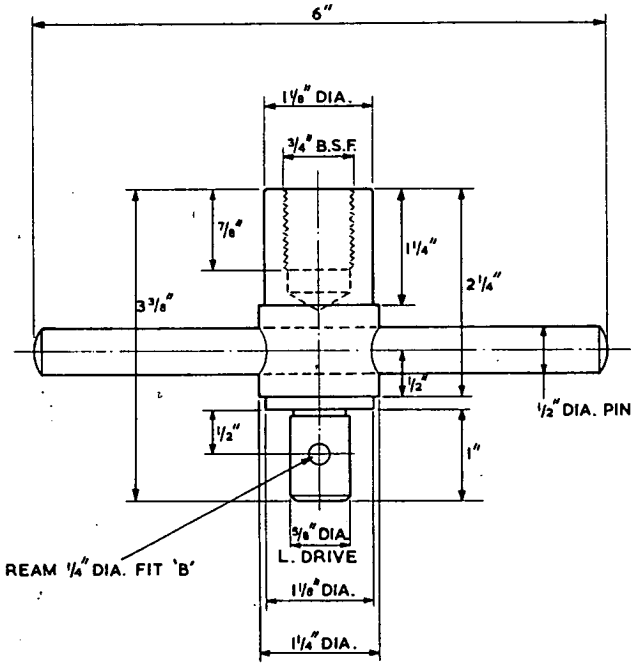


C.510

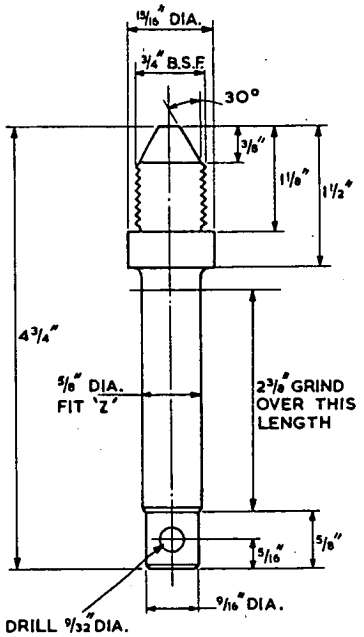
REAR SUSPENSION ARM EXTRACTOR T.F.N. 8039.



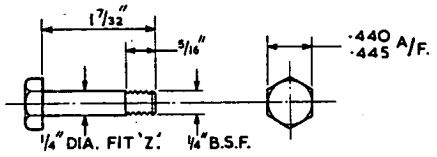
(1) 1 OFF. H.S.S. HARDEN AND GRIND



(3) 1 OFF. M.S.



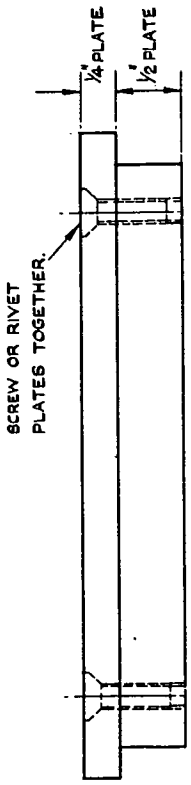
(2) 1 OFF. H.T.S.

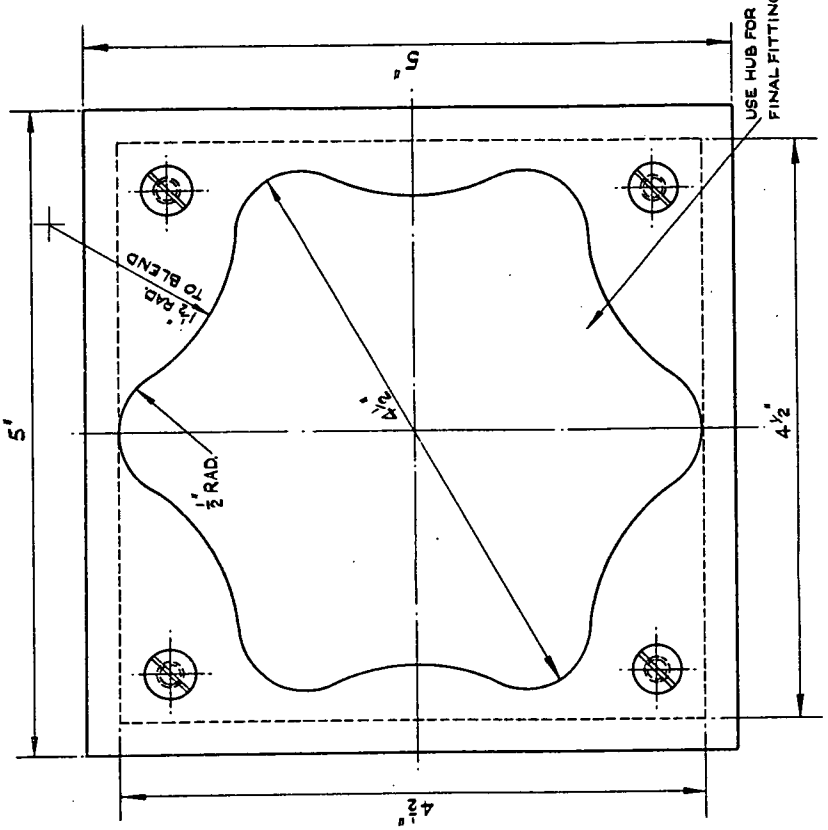


(4) 1 OFF. UBAS. CASE HARDEN AND GRIND. LEAVE THREADS SOFT

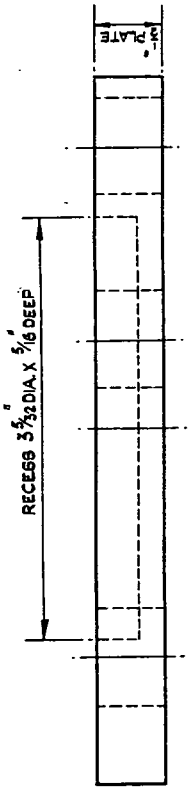
C.482.

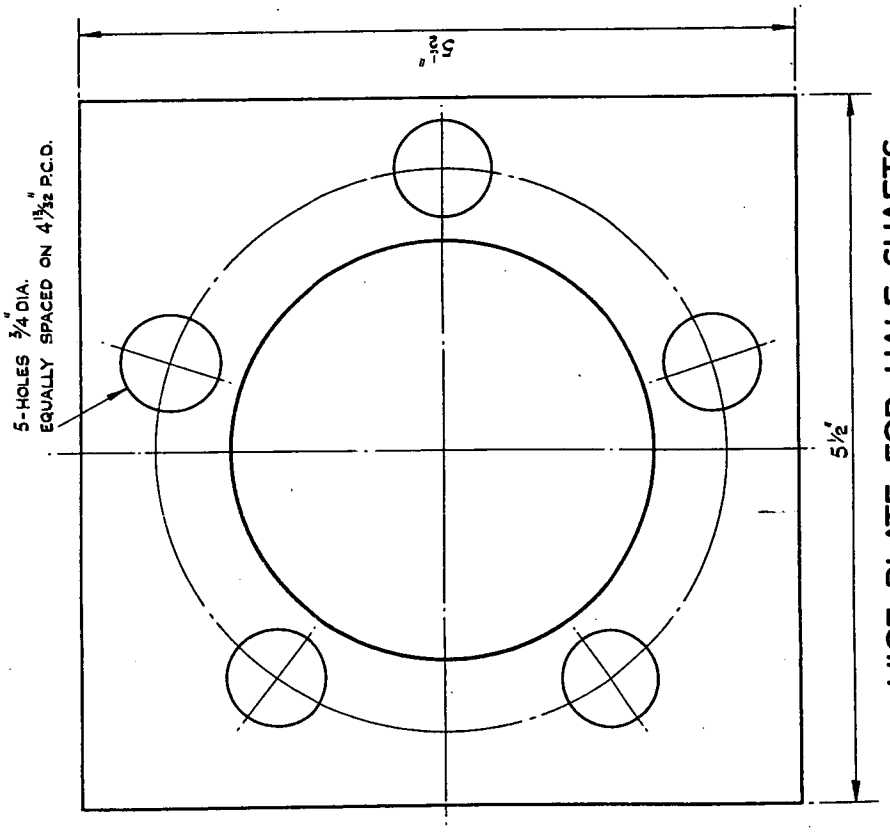
REAMER FOR REAR AXLE BUSHES. TFN. 4662.



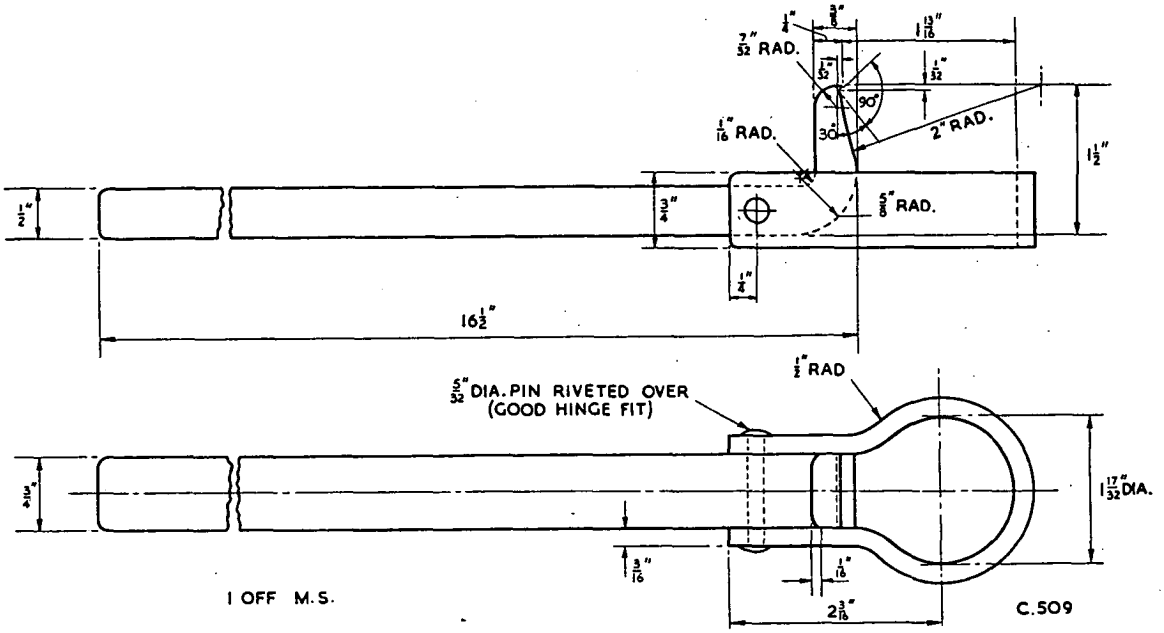


VICE PLATE FOR BEARING HOUSINGS.
T.F.N.5085

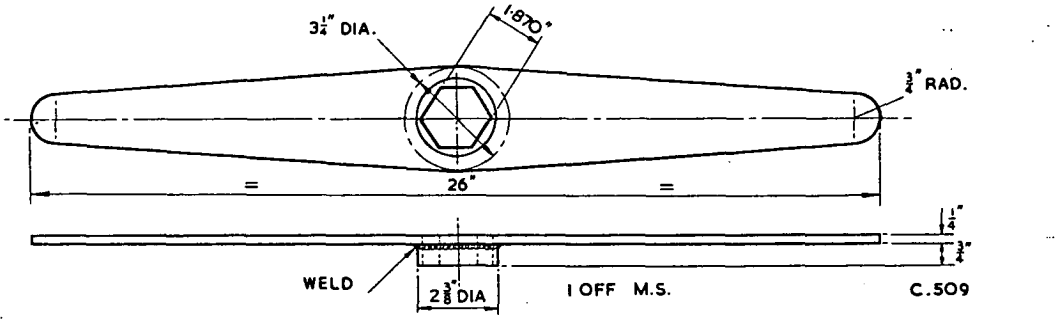




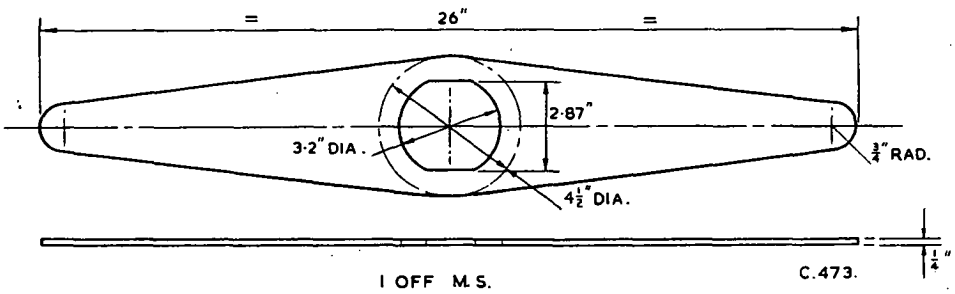
VICE PLATE FOR HALF SHAFTS
AND FRONT HUBS. T.F.N.5084



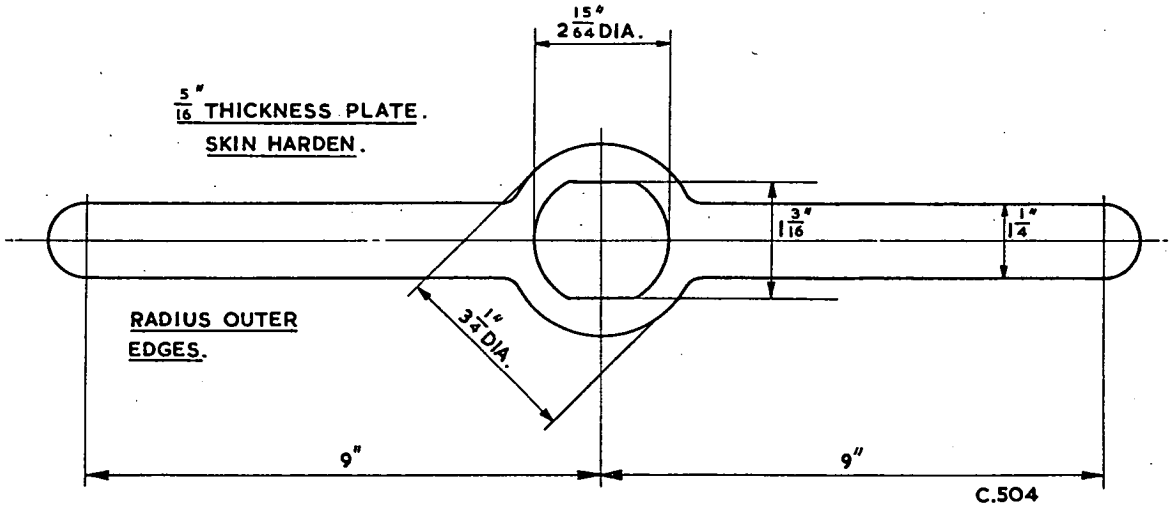
TURN UP TOOL FOR TABWASHERS T.F.N. 5024.



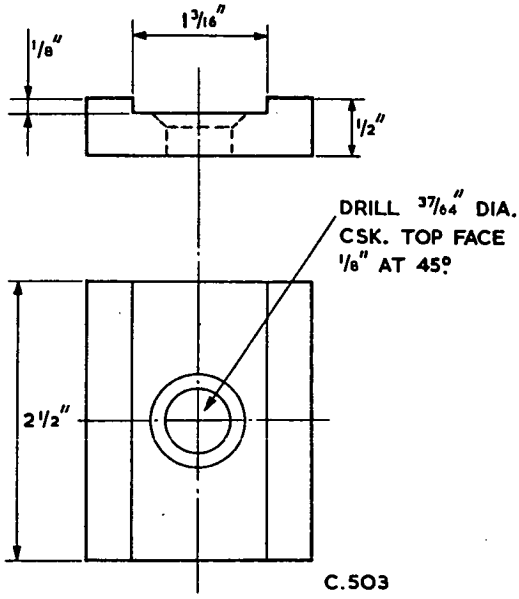
SPANNER FOR RETAINING RINGS T.F.N. 5022.



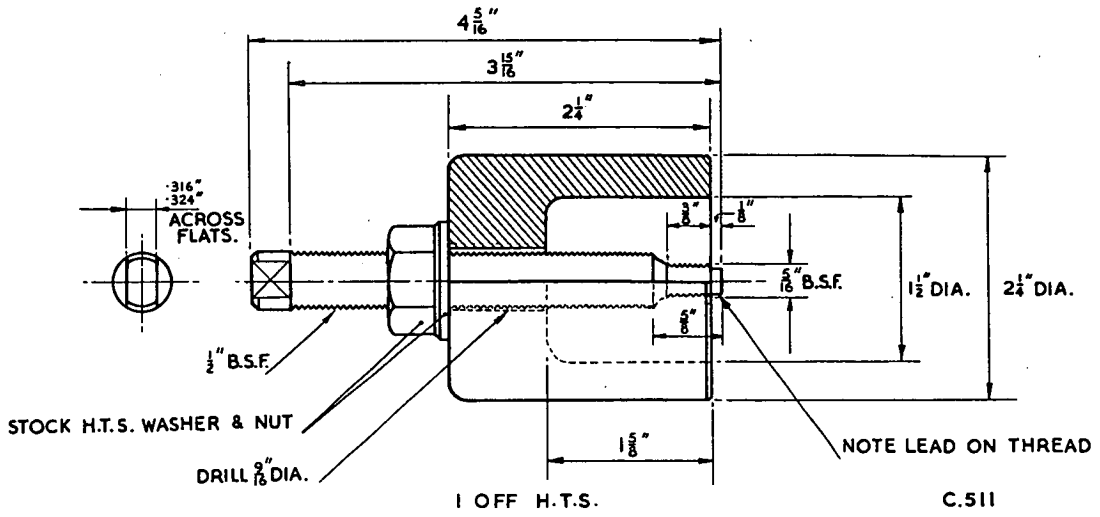
SPANNER FOR RETAINING NUTS T.F.N. 5023.
(REAR HUBS)



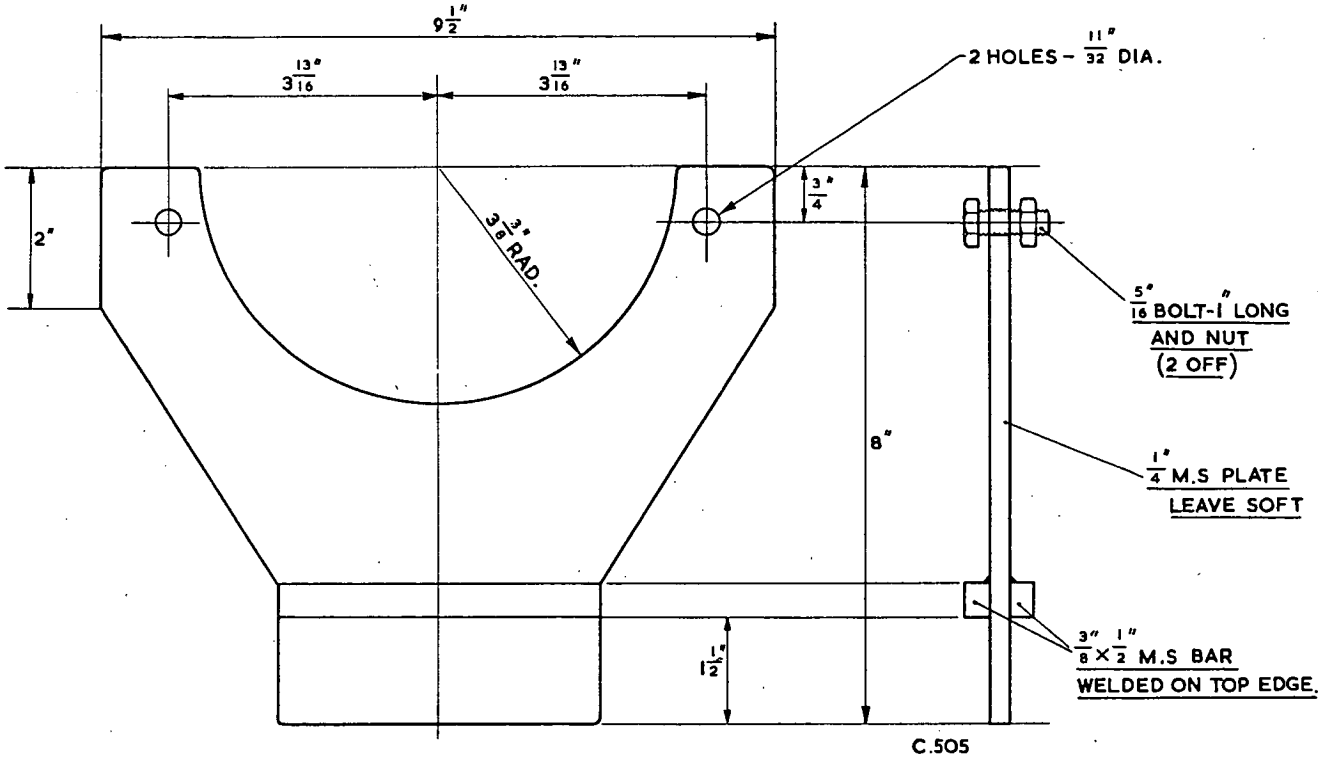
RING SPANNER FOR BALL BOLT ASSEMBLY. TFN.10085.



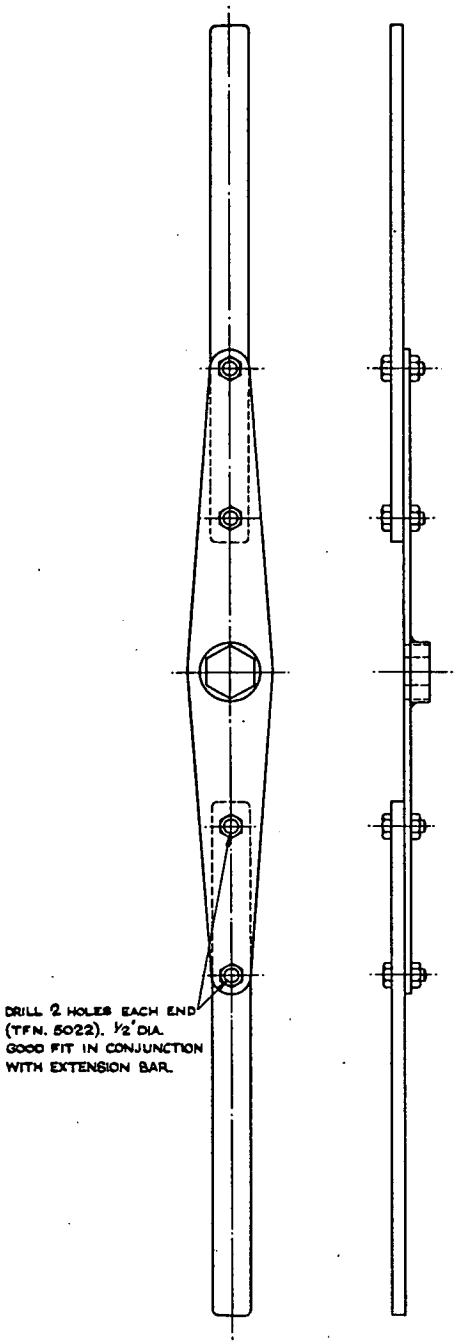
VICE PLATE FOR BALL BOLT ASSEMBLY. TFN.8792.

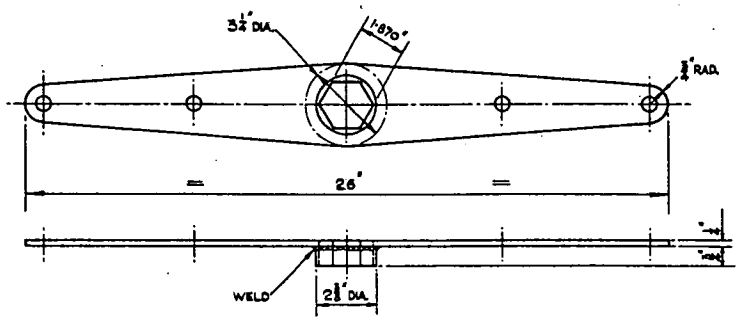


TORSION BAR EXTRACTOR T.F.N. 5026

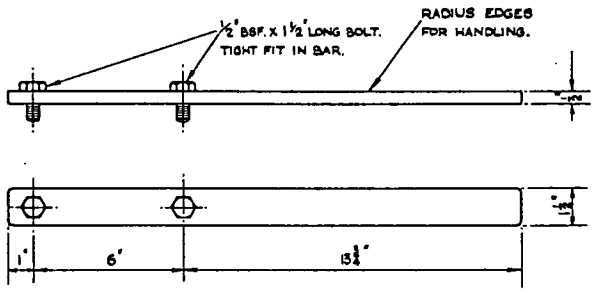


VICE FIXTURE FOR DIFFERENTIAL ASSEMBLY. TFN.5053



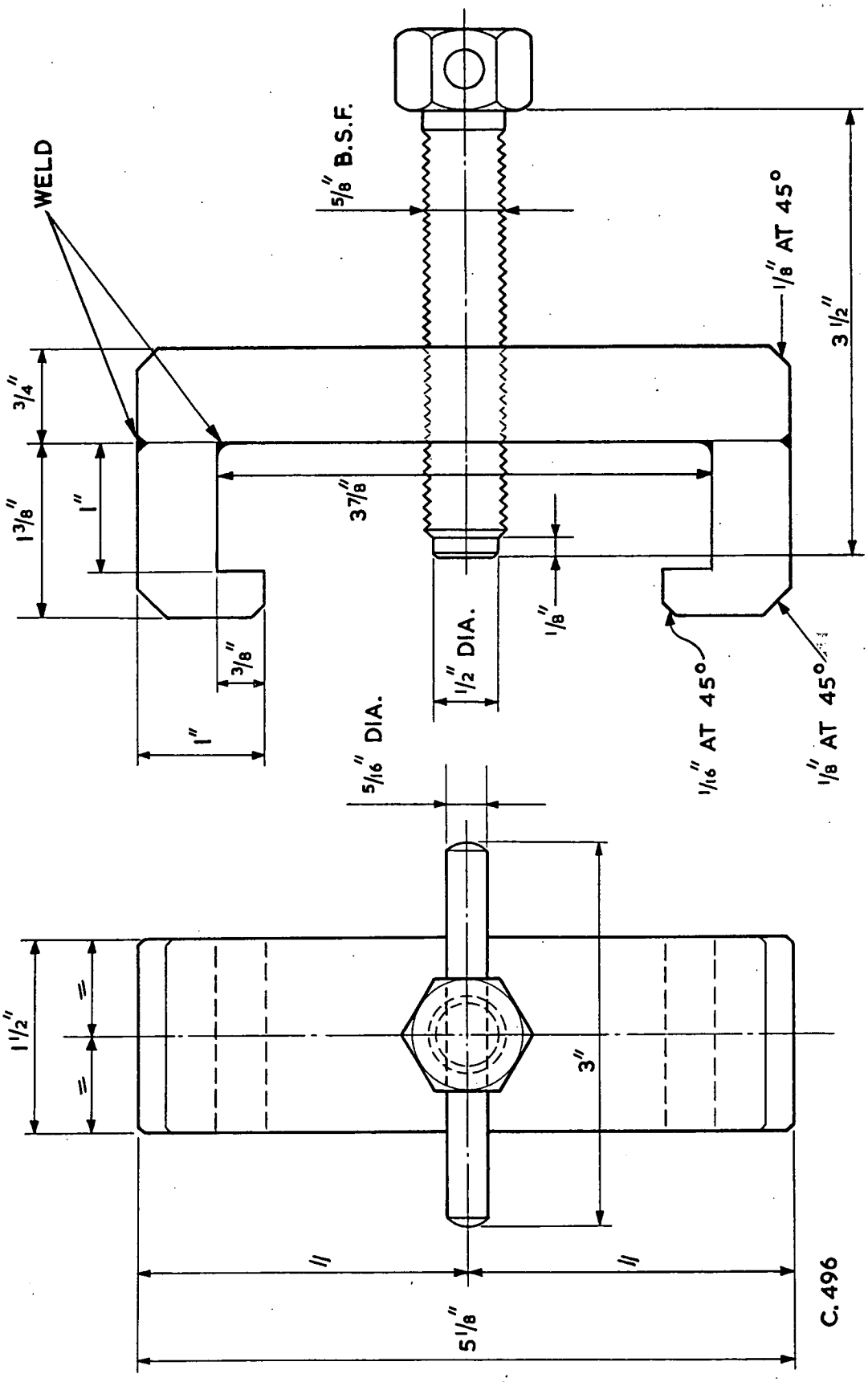


1 REQD. M.S.

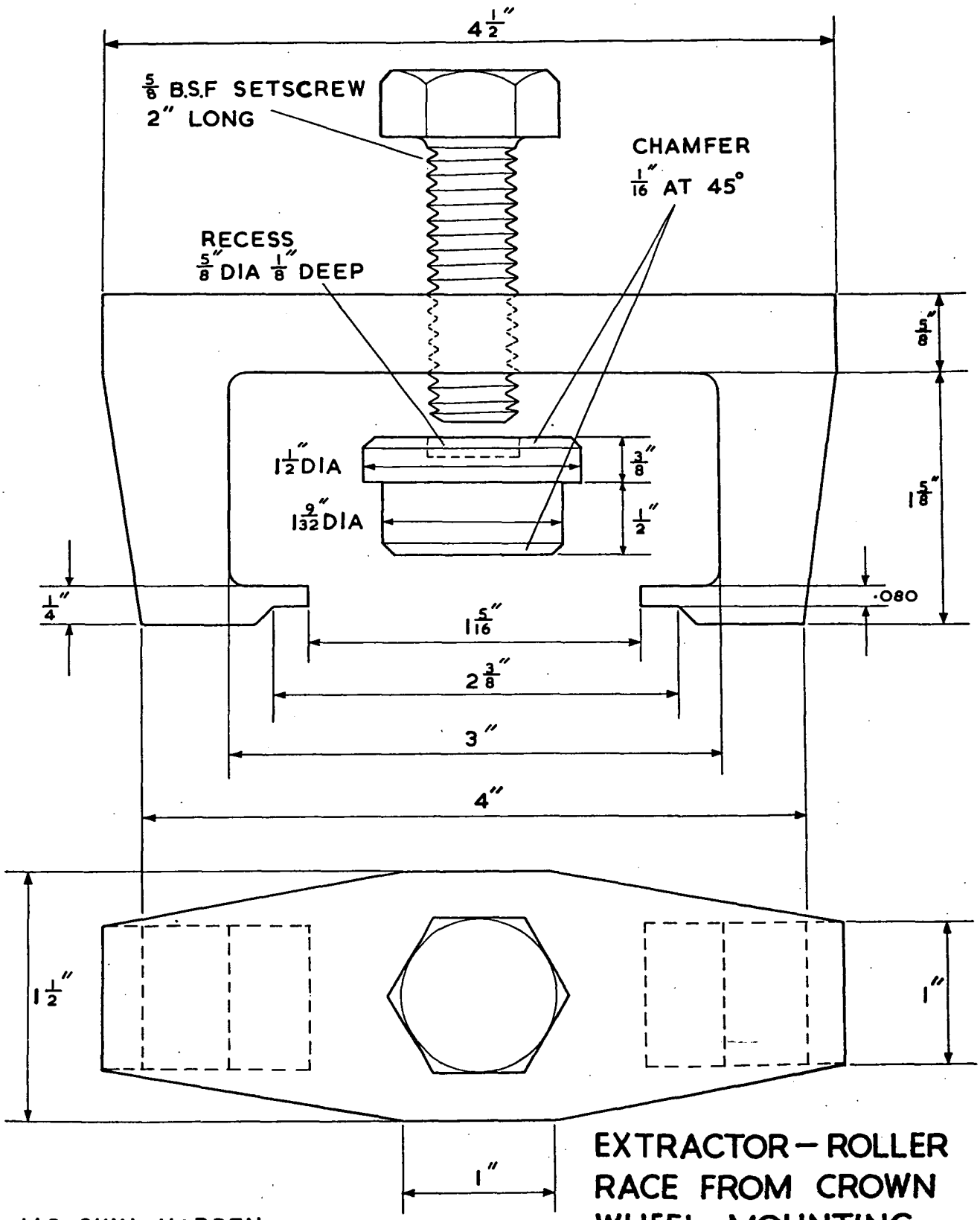


2 REQD. M.S.

SHOWING SPANNER T.F.N. 5022 FOR HALF SHAFT RETAINING NUT WITH EXTENSION BARS TO OBTAIN ADDITIONAL LEVERAGE.



COMPANION FLANGE EXTRACTOR. TFN. 8450



M.S. SKIN HARDEN

EXTRACTOR – ROLLER RACE FROM CROWN WHEEL MOUNTING.
TFN. 5057. C.502

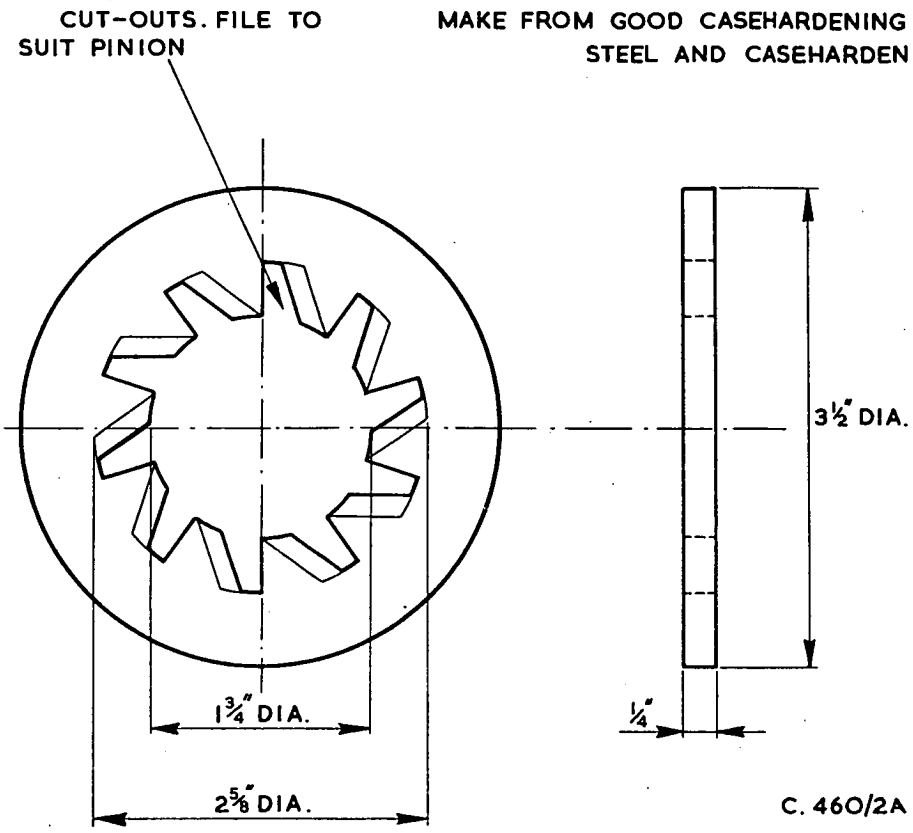
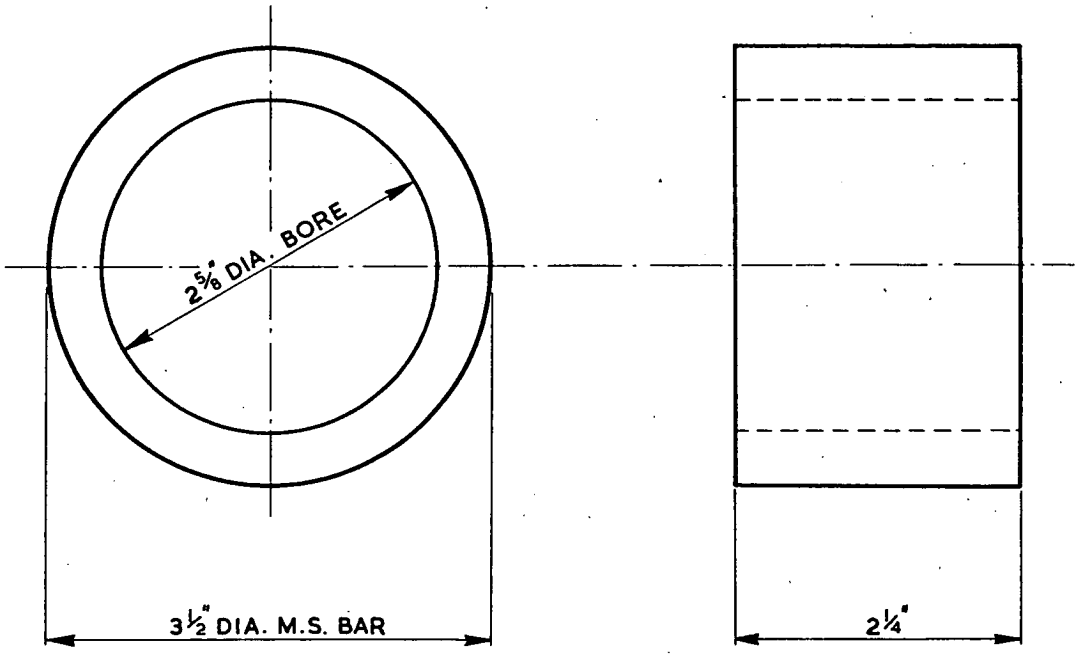
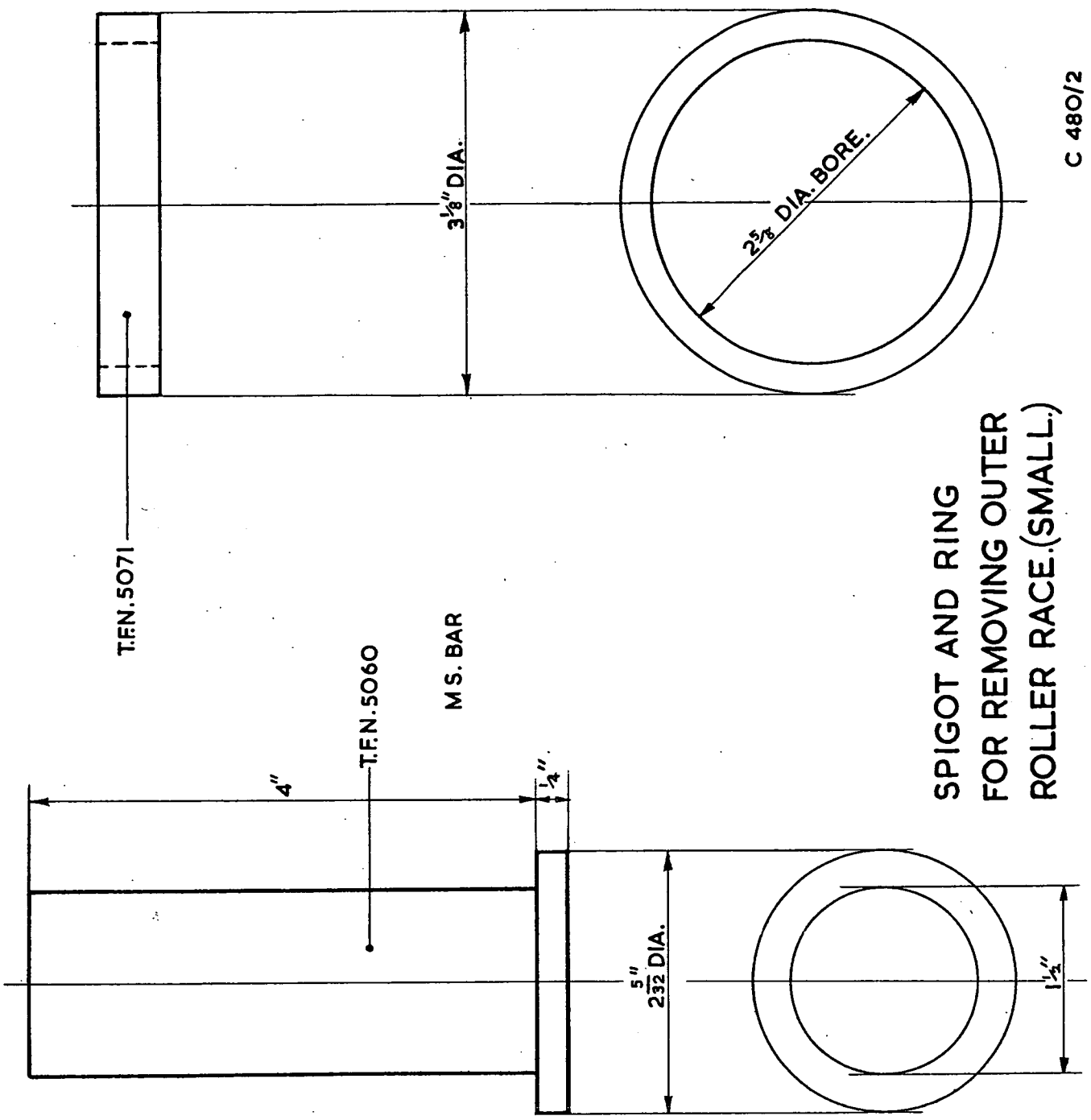


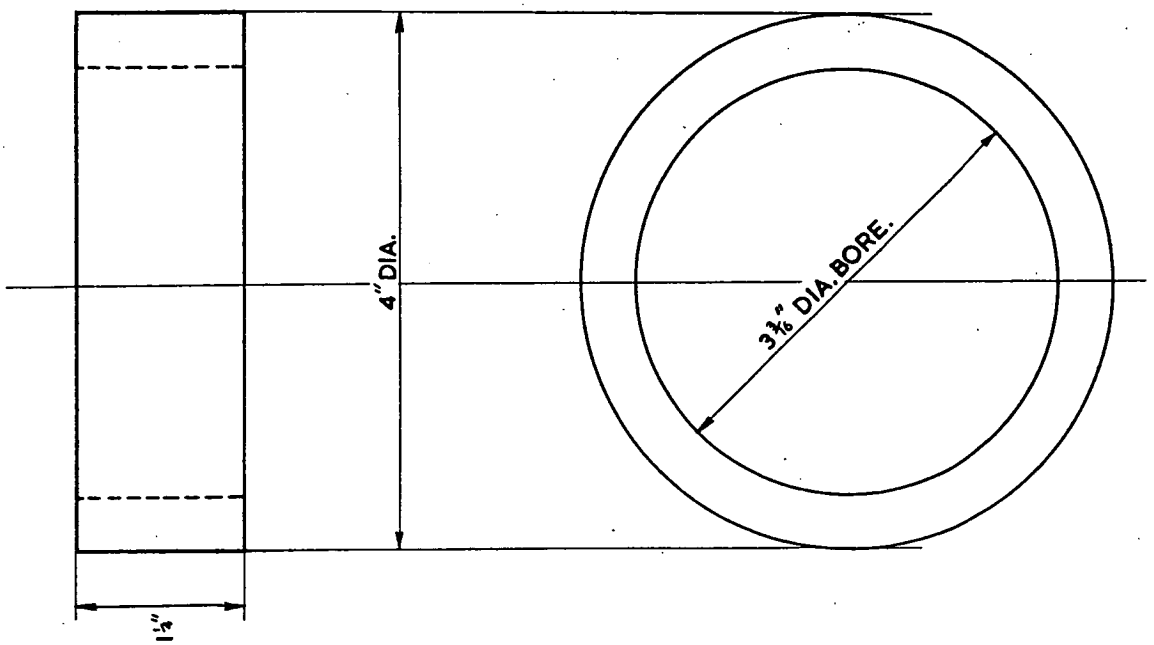
PLATE FOR REMOVING ROLLER RACE FROM DRIVING PINION. TFN. 5058.



SUPPORT RING FOR PRESSING THE ROLLER RACE FROM THE PINION. TFN. 5059.

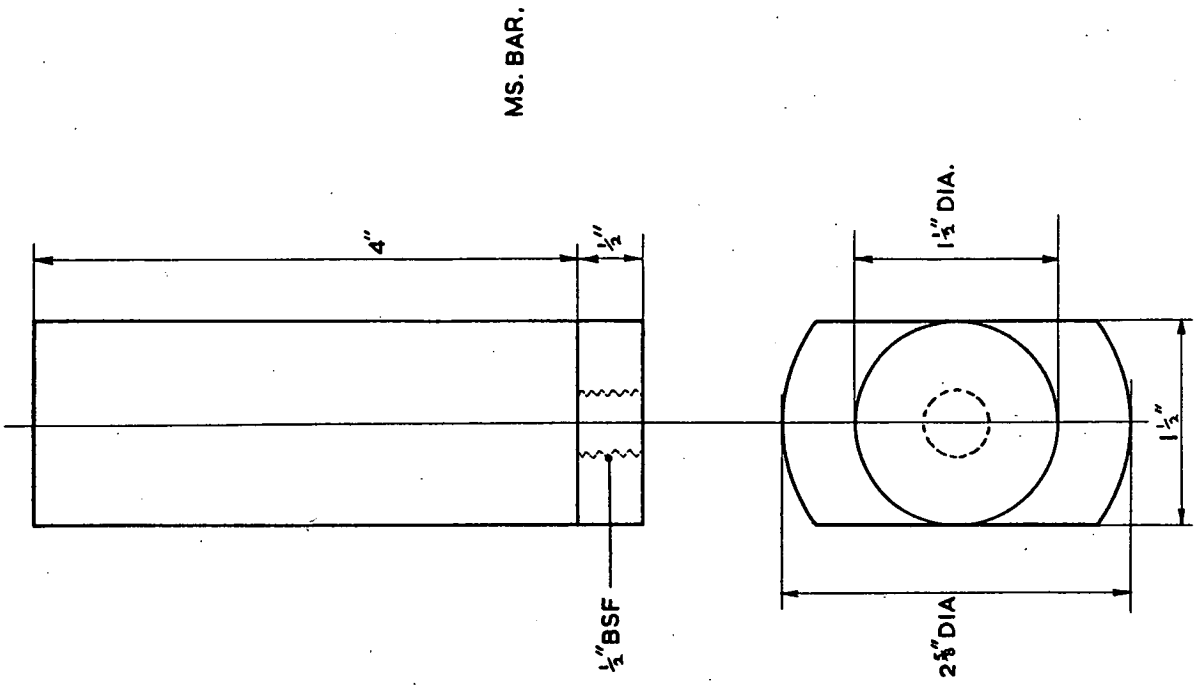


SPIGOT AND RING
FOR REMOVING OUTER
ROLLER RACE.(SMALL.)

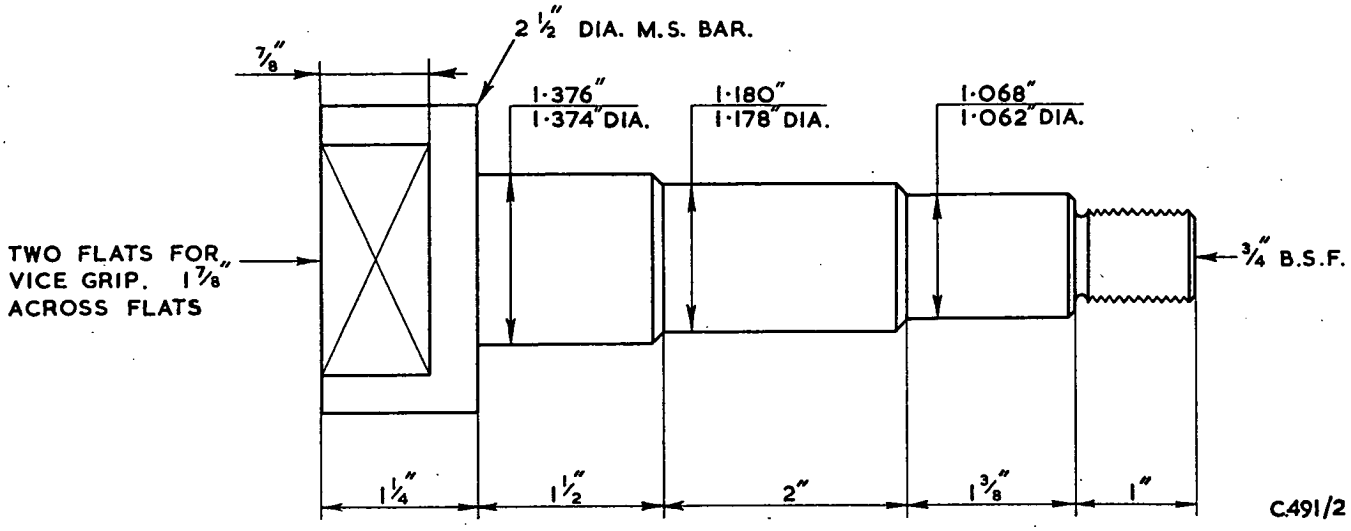


C 480/1

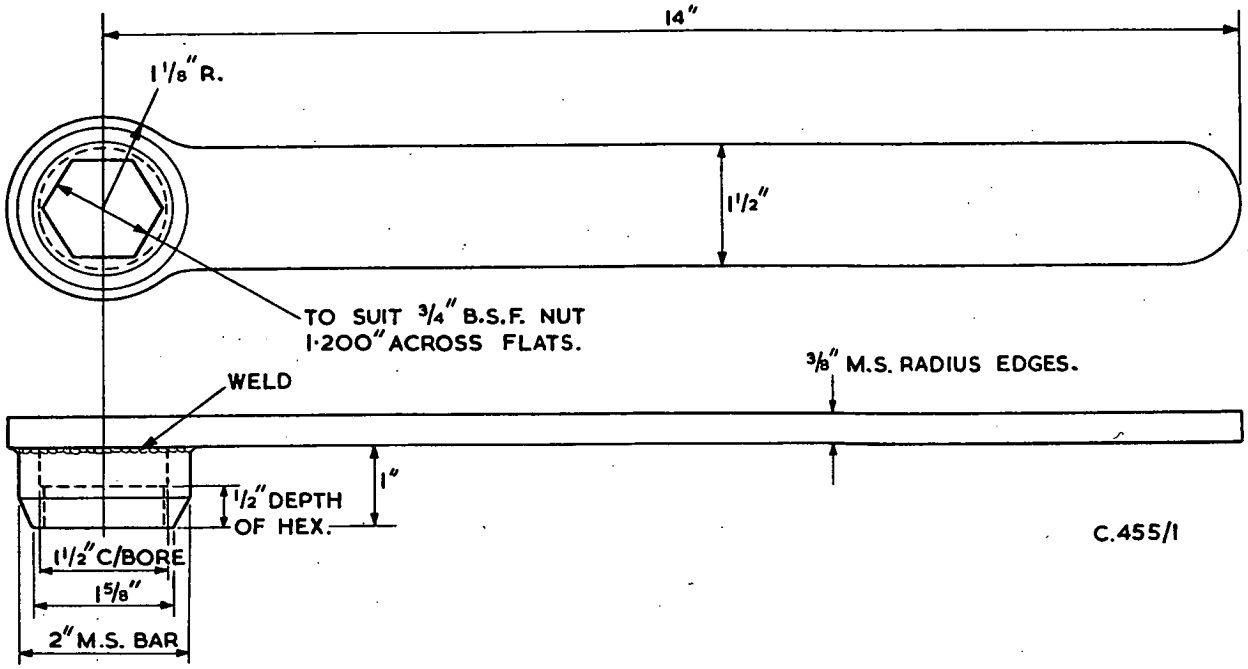
RING FOR PRESSING OUT ROLLER BEARING. T.F.N.5062.



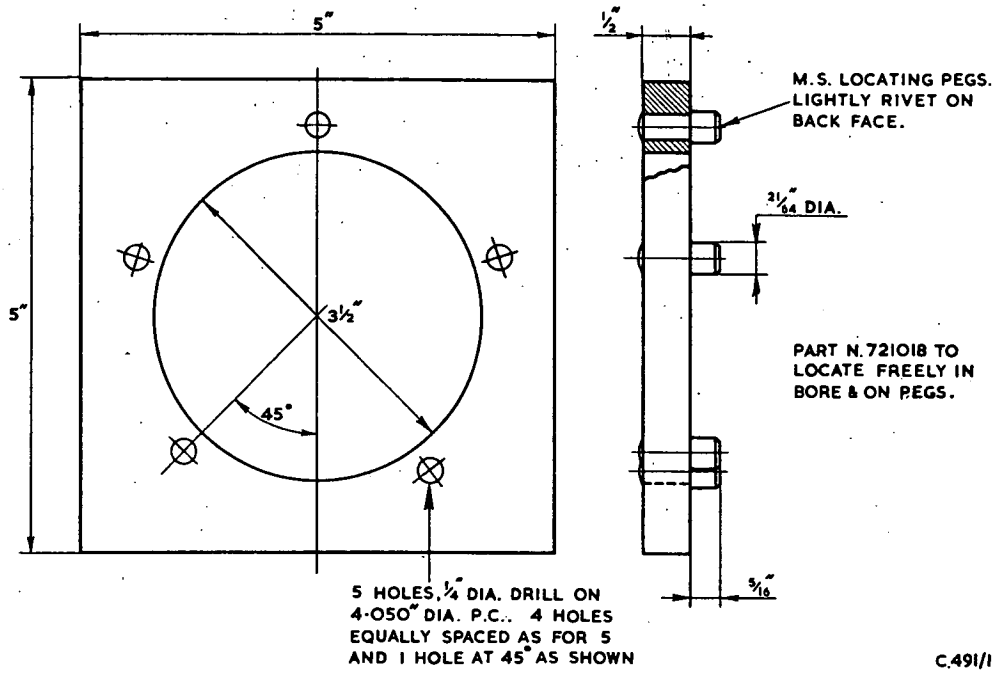
SPIGOT FOR REMOVING OUTER ROLLER RACE. (LARGE) T.F.N.5061.



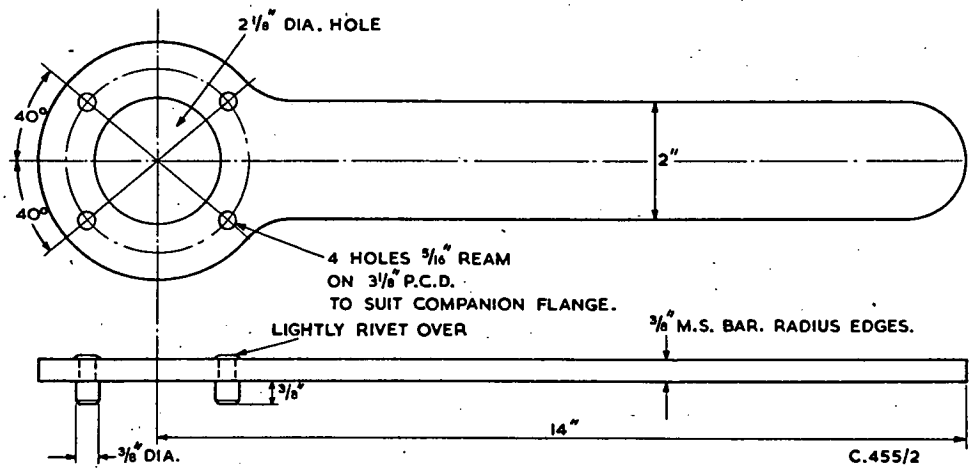
DUMMY DRIVING PINION. TFN. 5063



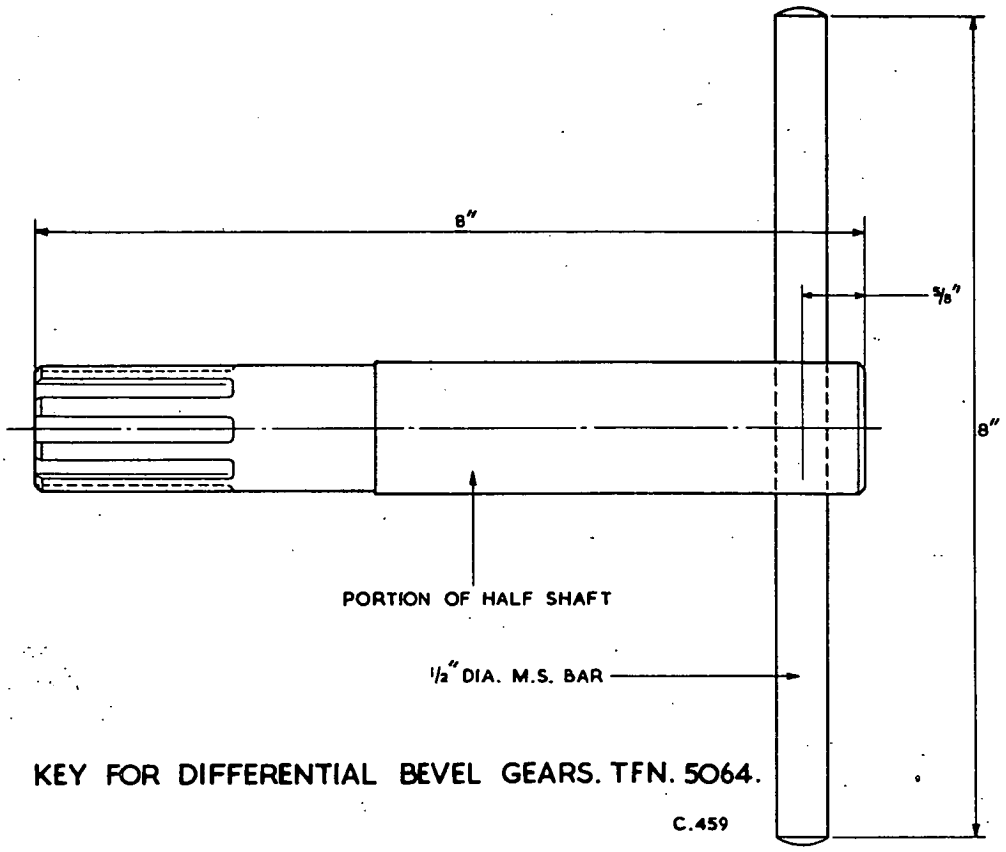
SPANNER FOR NUT ON DRIVING PINION. TFN. 5054.



VICE PLATE FOR BEARING HOUSING. TFN. 5052

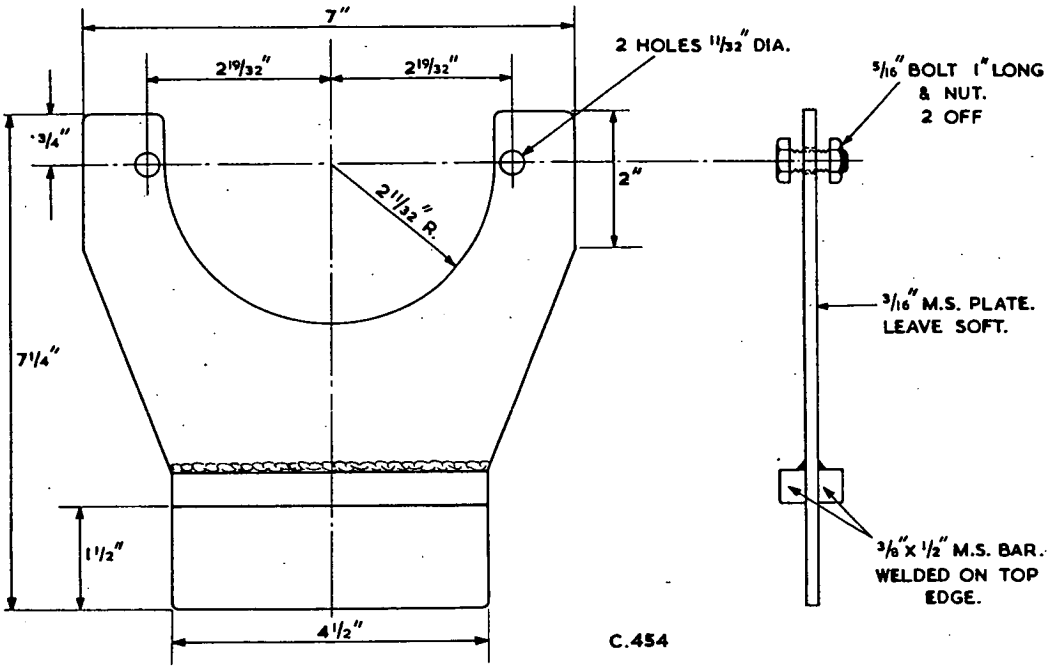


SPANNER FOR COMPANION FLANGE. TFN. 5055



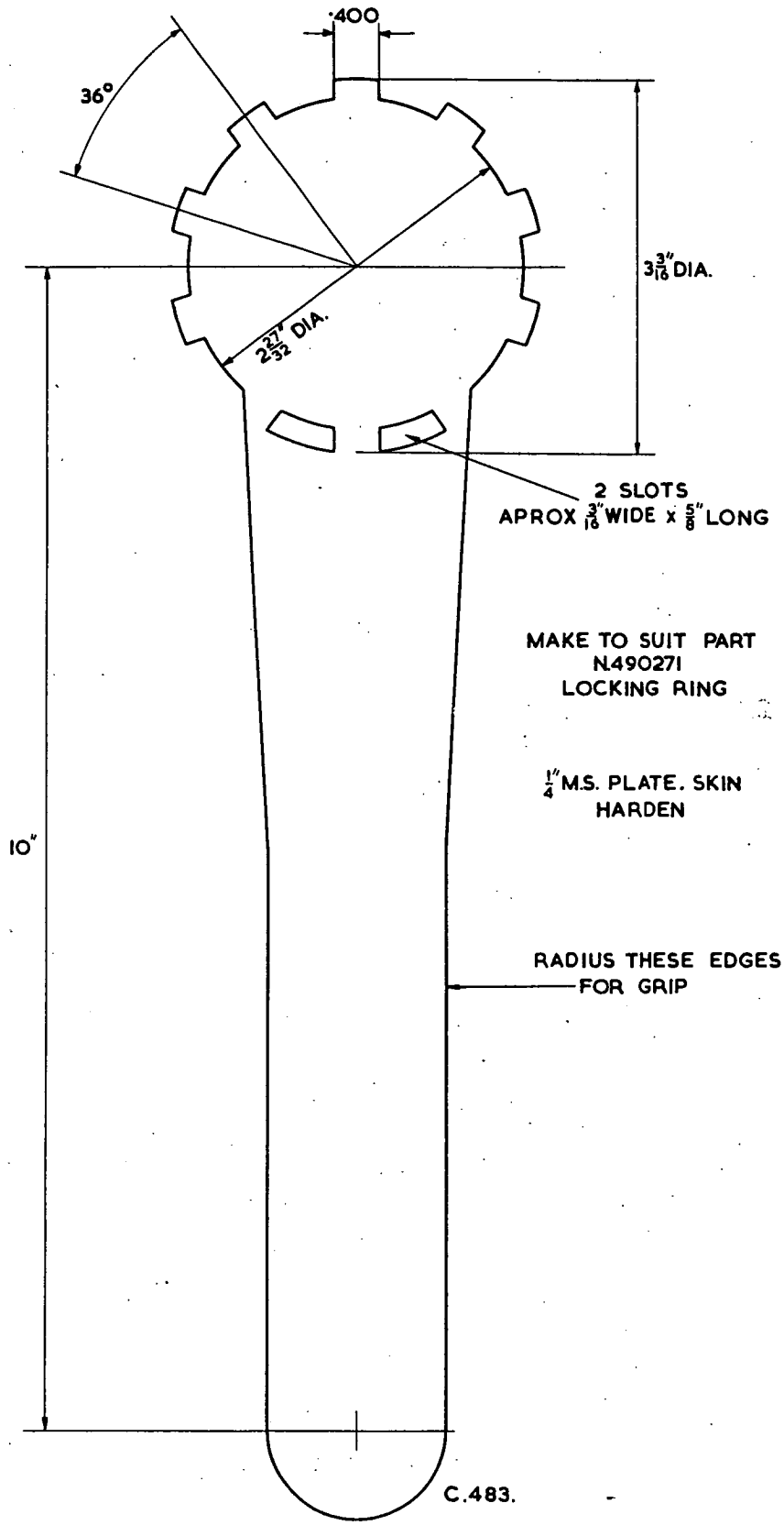
KEY FOR DIFFERENTIAL BEVEL GEARS. TFN. 5064.

C.459



C.454

VICE FIXTURE FOR CROWN WHEEL MOUNTING. TFN. 5056.



SPANNER FOR LOCKING RING. TFN. 5065.

Rear Axle Reg. 405 215

405-1-30003.

SER. L. 117